

# METAL FINISHING

DEVOTED EXCLUSIVELY TO METALLIC SURFACE TREATMENTS

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## COMING SOON

Abstracts from the report of the British Metal Finishing Productivity team, comparing British and American finishing methods for maximum efficiency.

A survey of the requirements of naval aircraft for protective finishes.

An instructive article on the possible applications of chelating agents in the plating and finishing field.



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New Year

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# The WASHINGTON OBSERVER



George W. Grupp

*News and Views from The Nation's Capitol*

. In the second quarter of 1952 small users of controlled materials will be relieved of filing CMP-4B applications for the allotment of aluminum, copper and steel.

. NPA Order M-9 has been amended to further restrict the monthly purchase of small sized orders of slab zinc without specific NPA authorization.

. The National Production Authority has informed the Heavy Metal Tank industry that it is considering an order limiting the production of such containers because of the critical shortage of steel.

. The NPA contemplates issuing a new order which will limit the use of copper in the manufacture of street, highway, commercial, industrial and residential lighting fixtures. The proposed order will prohibit the use of copper except in current-carrying parts and a few other exceptions.

. Dr. William Blum, Assistant Chief of the National Bureau of Standard's Chemistry Division and Chief of the Electrodeposition Section, retired on December 31, 1951 after more than 42 years with the Bureau.

. A brass, bronze, aluminum, lead and copper scrap campaign is now in full swing throughout the United States. The Army is salvaging cartridge brass scrap in Korea, Japan, Europe and elsewhere.

. About 27 per cent of the 125,000 tons of copper allocated for the first quarter of 1952 will be for military production.

. The average hourly earnings of durable goods production workers is \$1.71. This is expected to reach \$1.80 an hour by June, 1952.

. Federal Trade Commissioner John Carson believes that a sure fire method of getting lower prices is to conduct a pitiless publicity campaign on big business profits.

. The Office of Naval Research, which has been studying the corrosion-inhibiting effectiveness of traces of organic materials added to metal cleaning, electroplating and slushing baths, has developed an instrument to measure this effectiveness.



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\* The Ronol Bright Copper Process is a development of Ronol Chemicals Inc., Brooklyn, N. Y., for which process patents are pending.

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## 1952?

Looking ahead at the coming year and attempting to foresee a pattern of metal finishing activity is somewhat akin to taking a ride through Coney Island's darkened "Tunnel of Love" with a chance acquaintance — uncertain, to say the least, perhaps even hazardous, but fun trying! So let's polish up the crystal ball and have a look into 1952.

The turn of the year finds our tremendous armament production program just beginning to make itself felt in the finishing department. While it is still a minor part of the total finishing effort, it should pick up speed rapidly around the second quarter of the year. Even barring an all-out war, which seems to become more remote with the increasing tempo of our military production, we are still committed to equipping enough of the world's armies to call for a high level of output for military items.

On top of this will be a very substantial output of consumer durables, automobiles and appliances which, though not as high as in '50-'51, will still almost equal our best pre-War years and call for a sizeable amount of plating.

The emphasis will continue to be on functional plating (as opposed to purely decorative plating), electroforming, anodizing, hard chrome, phosphating, and chromate treatments. It would not be surprising to see controls on cadmium and nickel plating eased sometime during the year, to compensate for the ever-tightening situation in high-purity zinc and copper. Copper especially will get much tighter, but the small percentage used for plating purposes will probably continue to be available (with a little scratching around to find it!).

Anyone responsible for charting the course of a business enterprise will recognize the necessity for sound thinking and planning, so as to avoid both speculation and over-cautiousness. Don't bite on the "get rich quick" schemes, nor crawl into a shell and avoid natural progress. It's a duty to yourself, your employees and your country to prove that, no matter how great or prolonged the pressures imposed on us by power-mad slave nations, it can be taken in stride and mastered. Free-thinking men must prove that they cannot be defeated, militarily nor economically, by those who are bent on our destruction.

*W. A. Raymond*

Editor

**Metal Finishing**

**Wishes You A Happy New Year**

# Metal Finishing Developments in 1951

By Walter A. Raymond, *Managing Editor*



**T**HE year 1951 will go down in plating history as the period when the long clutching tenacles of shortages, allocations, and restrictions reached out and entwined themselves firmly around the nation's metal finishing plants, and either brought them into the swirling orbit of war production or squeezed them nearly lifeless.

True to the traditions of enlisting soldiers everywhere, many metal finishing plants were forced to tear themselves from the arms of their beloved nickel plating and, in the performance of their duty, to console themselves with inferior, but available substitutes for decorative applications.

While cadmium and nickel plating were the first to be government regulated, later and more serious shortages necessitated curtailment of copper, tin, and zinc plating as well. A decided slump in plating activity, especially amongst job shops, was apparent during the middle of the year, and only towards the last two months were there signs that the momentum of our war production program was taking up the slack somewhat. It will be many months before the volume of military plating and finishing reaches a substantial portion of the total activity, however.

The past year could be characterized as being an almost endless search for substitutes, with a great many new and old finishing systems being tried and evaluated. The automotive industry, largest user of decorative finishes, spent a lot of money and time in this direction. Unfortunately, nothing has been developed

so far that is superior to the copper-nickel-chrome or nickel-chrome finishes. As a matter of fact, necessity forced many manufacturers to adopt finishing systems known to be inferior to what were formerly used. *C'est la guerre!* In about a year we can expect to see the inevitable result, if we haven't seen it already!

The shortage of plating metals spurred the development of decorative organic surface coatings, and in many cases such coatings have captured markets permanently. Although the hardness of metallic coatings is lacking, the ease of application and countless decorative effects produced by organic coatings make them very real competitors for many items.

While it may be true that the country's greatest need is a good 5¢ nickel, the plating industry's most urgent need is for an "alloy" of nickel and rubber, combining the protective and decorative properties of the metal with the "two-way stretch" needed to make the available supply go around.

In the following paragraphs will be found some notes on specific developments of the past year which seem worthy of special mention.

## *Theoretical*

The academic problems of deposit porosity, stress, hardness, orientation, etc. were pushed into the background by the more urgent production needs of the day, yet one cannot deny that such studies may some day result in developments that will alleviate or even eliminate the vexation of metal shortages in times of emergency by permitting thinner, denser deposits to do a comparable job.

Thon and his co-workers<sup>1</sup> continued their A.E.S. research on porosity of plated coatings as affected by the hydrogen content of the deposits. They found a decided difference in behavior of the hydrogen, depending on whether it was "co-deposited" hydrogen or "electrolytically incorporated" hydrogen. They further classified "co-deposited  $H_2$ " into two types — "supersaturation  $H_2$ " (easily escapes from deposits at room temperature or on slight heating) and "retained  $H_2$ " (tenaciously retained by the deposit even after prolonged heating). "Electrolytically incorporated  $H_2$ " is also loosely held by the deposit and can easily escape at room temperature. This work was a preliminary study, with no attempt being made as yet to relate  $H_2$  content with porosity.

Erdmann<sup>2</sup> discussed the nature and occurrence of pores with respect to the problems they introduce in obtaining good protective finishes.

The increasing emphasis being placed on the mechanical properties of electrodeposits, as opposed to their purely decorative and protective effects, is de-



Bright chromized coatings on small parts provide excellent corrosion resistance with good appearance.

manding a more thorough knowledge of such properties as tensile strength, ductility, etc. Before we can depend on the numerical values assigned for these properties it is first necessary to be sure the test methods used are reliable and reproducible. A much-needed study of this aspect is being continued by *Read and Prater*<sup>3</sup> which should turn up information of considerable value in expanding the use of deposited coatings to meet special engineering requirements.

*Shome and Evans*<sup>4</sup> introduced an improved method for determining the porosity of plated coatings in terms of total uncovered area, rather than in terms of total number of pores. They consider the total uncovered area to be more significant. Their work also suggests that porosity in a deposit can be reduced by increasing the number of initial nuclei, such as by starting to plate in a high current density "strike" bath.

An enlightening electron diffraction study of electrodeposits by *Finch and Layton*<sup>5</sup> clarified the reasons for levelling, adhesion, stress and porosity of metallic deposits. They found that adhesion was poor whenever the deposit crystal growth was not influenced by the base-metal crystal structure; also, that cohesion (strength) in a deposit increased as the crystal size decreased, provided the crystalline growth was primarily lateral growth (as opposed to outward growth). As for residual stress in deposits, outward-type crystal growth increased the internal tensile stress of nickel and iron deposits. With nickel and copper, changes from original compressive stresses were noted with increases in current density. These authors disagree with the popular theory that stress relief of deposits results in crystal orientation.

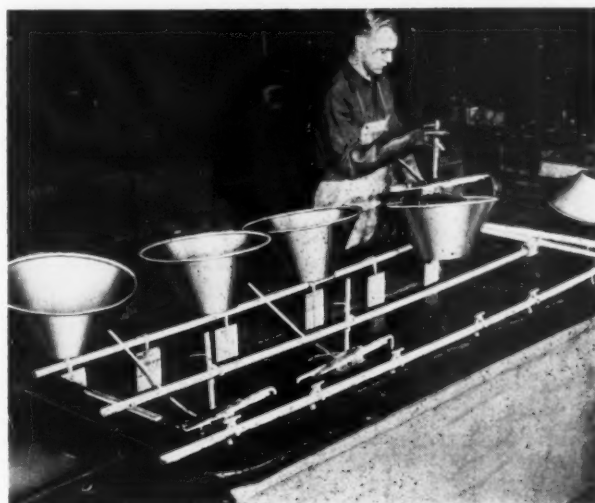
An extensive study of residual stress in deposits on the fatigue strength and other properties was made by *Almen*.<sup>6</sup> Tensile stresses were shown to decrease fatigue life, compressive stresses to increase fatigue life. Measurements on zinc deposits (compressively stressed) on steel showed improved fatigue life, whereas highly tensile-stressed deposits such as nickel and chrome lowered fatigue life of the base metal specimens. Low-stress (tensile) and compressively-stressed nickel deposits produced under special conditions showed less tendency to crack during salt-spray exposure, hence increased the corrosion resistance.

#### **Electropolishing - Chemical Polishing**

Activity in the electropolishing field seems to be mostly in the patent-granting phase, although undoubtedly additional commercial use has been made here and there. On the whole, however, the process takes hold much more slowly than one would think befits its potentialities.

Patents were granted for electropolishing baths for silver,<sup>70</sup> aluminum<sup>71, 72, 73</sup> nickel,<sup>74</sup> steel,<sup>74, 75</sup> copper<sup>76</sup> and brass.<sup>77</sup> Several new electropolishing techniques were also patented, such as the "pad" method of *Mazia*,<sup>78</sup> the mechanical wiping method of *Truehaft*,<sup>79</sup> and the super-imposed A.C. process developed by *Smith*<sup>80</sup> for cyanide baths.

Chemical polishing of aluminum, whereby a bright lustrous surface is produced by immersion only, was an active field during the past year, with two new commercial processes being announced.<sup>81, 82</sup> *Gadeau*<sup>83</sup>



Non-decorative uses for electrolytic polishing are becoming widely used, such as in the preparation of television tube cones for glass-to-metal seals.

also described the "Alupol" process for chemical polishing aluminum. This is a two-step process involving a fused salt bath "polish" and a phosphoric-nitric bath for bringing out the luster.

A patent<sup>84</sup> for chemically polishing tungsten was also granted.

#### **Pickling - Acid Dipping**

Considerable interest was noted during the past year in a British process for de-scaling and de-rusting steel in an alkaline electrolytic bath.<sup>66</sup> A similar process<sup>67</sup> was developed in the U. S. Both of these processes have the inherent advantage of alkaline baths in not leaving the cleaned surface susceptible to rapid rusting again. In the American process it is also possible to deposit a plated coating in the same bath after de-rusting has been completed.

A method for reducing the cost of phosphoric acid pickling was described by *Paulson and Gelwood*.<sup>68</sup> Reclamation of the acid by ion exchange enabled pickling costs to be comparable with sulfuric acid pickling, and in addition provided a very thin rust-resistant protective film. Due to the wider use of lubricated, phosphated sheets and strip for cold-working operations, this method could become commercially important.

A study of the diffusion of hydrogen through steel during electropickling was made by *Sully*<sup>69</sup> and his co-workers, who found that the diffusion rate depends on the particular electrolytic conditions, especially the formation of films, and not simply on the amount of hydrogen liberated at the cathode.

#### **Copper Plating**

Because of the scarcity and restrictions on nickel for plating, extra emphasis was placed on copper as an undercoat for chrome in decorative finishes. In many instances a single deposit of copper has wholly replaced the former copper-nickel combination, especially in the automotive and home appliance fields. The use of P-R techniques with cyanide copper has gained wider acceptance, with the result that somewhat thinner, but denser, copper coatings can be used to advantage, with a resulting saving in copper, which is rapidly becoming the nation's No. 1 scarce metal.



One recent development which could have a revolutionary effect on cyanide copper plating is the use of chelating agents in acid copper baths to suppress the formation of spongy immersion deposits on steel.<sup>7</sup> By balancing the amount of "free" copper ions and the chelated (complexed) copper ions, it is possible to obtain a thin, very adherent copper coating by immersion only. No substantial thickness is built up, however. The same thing can be done with acid cadmium solutions. In the case of copper, the significance of this development lies in the fact that cyanide copper baths need no longer be used for plating on steel. The "strike" can be made from the chelated acid bath, followed by a heavy copper deposit from a regular acid sulfate bath. Simplification of the waste disposal problem is only one of the several possible advantages in such a plating cycle. It is not beyond reason to hope that a single acid copper bath could be developed which would not give any immersion deposit on steel, yet would permit the deposition of heavy adherent copper deposits when the current was turned on.

One new commercial bright copper bath<sup>8</sup> was introduced during the year, and a patent was granted to *Holt*<sup>9</sup> for a trimethyl-C-cetyl alpha betaine and trimethyl phenyl ammonium halide addition to cyanide copper solutions to obtain pit-free bright deposits.

### Nickel Plating

Nickel went off to war during 1951, resulting in near chaos in the plating industry. Allotments for plating were far less than requirements, the principal exception being for automotive bumpers. For other products, less nickel or alternate finishes were used where possible. A thriving little black market in nickel was nipped (alas, not in the bud) by the legal authorities, in which prices as high as \$4.50 per lb. were quoted!

While there was considerably more search than research in the nickel plating field during the year, several developments are worthy of mention.

The necessary conditions for producing relatively ductile deposits of bright nickel from organic bright nickel baths were stated by *Patching*.<sup>10</sup> These conditions are pure solutions, a minimum of organic addi-

tion agents consistent with adequate brightness, and high boric acid content.

The fundamental mechanism behind the brightness of nickel deposits is apparently still pretty much in doubt, as *Clark* and *Simonsen's*<sup>11</sup> investigations showed no correlation between brightness, orientation and grain size. *Leidheiser* and *Gwathmey*<sup>12</sup> however, in their study of bright nickel plating on single spherical crystals, found that nickel deposits on certain planes in the single crystal were monocrystalline and remained bright and smooth even up to very thick deposits. Deposits on other planes of the same crystal became polycrystalline and matte soon after the start of deposition. This would indicate a relation between brightness and preferred orientation.

Periodic reverse plating has not as yet become much of a factor in nickel deposition, but indicative of the fact that this field is being actively investigated is the granting of a patent recently to *Westinghouse International*.<sup>13</sup> This patent covers nickel, cobalt, and nickel-cobalt alloy plating. Extremely wide bright plating ranges are claimed, from several asf up to 500 asf.

A number of other interesting patents were granted for nickel plating. *Roehl* and *Wesley* were granted a patent<sup>14</sup> for a chloride-free bath for use in plating with insoluble anodes, including a method for replenishing the nickel ions in a separate unit. Two new bright nickel baths were patented, one by *Moy*<sup>15</sup> and another by *Brown*.<sup>16</sup> The removal of hydrogen embrittlement from chrome plated nickel deposits by heating was the subject of a patent by *Kasper*<sup>17</sup>, and *Bell* and *Schweiker*<sup>18</sup> obtained a patent for bright electrostripping solutions for nickel plate from steel. Several baths having stripping speeds ranging from .0002"/min. to .00006"/min. were included in their claims.

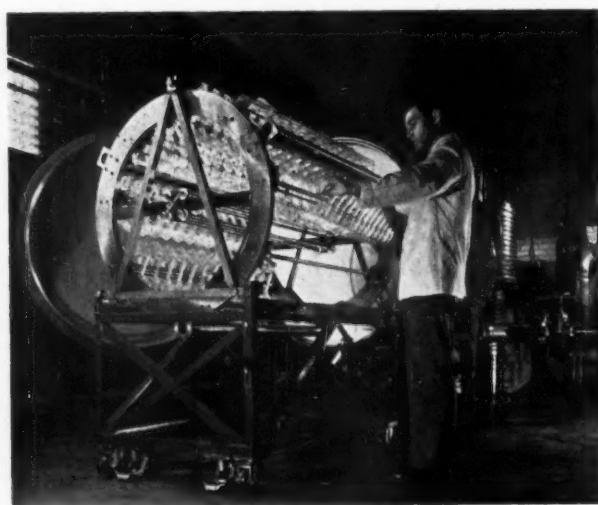
There was an indication that the hypophosphite immersion nickel plating bath developed last year by *Brenner* was finding some commercial application. Disclosure that the process could also be used to put an immersion nickel film on non-conductors will lead to many new applications.<sup>101</sup>

### Chrome Plating

Production of military items always calls for an increase in chrome plating activity, the past year being no exception. Outside of the issuing of a patent to *Berger*<sup>19</sup> for a bath containing hydrofluosilicic acid and ammonium molybdate, nothing much in the way of solution improvement was made during the year.

Hard chrome plating techniques, because of their specific nature, are usually not openly discussed. One exception is the method developed by *Wallbank*<sup>20</sup> of plating large iron rolls vertically, as opposed to the usual horizontal, partial-immersion technique. A patent<sup>21</sup> was issued to *Messinger* and *Lytle* for a special plating tank which could be used for vertical roll plating. It included an adjustable gate for varying the cathode area being plated.

One of the many "substitute" finishes tried during the year was a flash of chrome over cadmium or zinc, principally to protect these latter coatings against loss of luster. One proprietary process<sup>22</sup> for doing this was announced during the year. Chrome direct over copper has become a standard finish where nickel plating is



Deposition of thin films of various metals onto both metals and non-conductors by vacuum methods is rapidly becoming a proven production practice. Above scene shows an operator loading fixture, with vacuum equipment in rear.

not permitted. This is usually followed by a coat of clear synthetic enamel.

A study of the effect on hardness of chrome deposits of the various plating conditions was made by *Howell*.<sup>23</sup> He found that the hardest deposits were produced at low C.D., low temperature, and low chromic acid content, and that the C.D. range just above that which gave brightest deposits resulted in maximum hardness.

### Zinc Plating

Zinc could be called the Cinderella of plating metals as far as 1951 is concerned. With nickel and cadmium in short supply and restricted in use, all eyes turned toward zinc as a protective and decorative finish. Two techniques for getting a bright, lustrous finish with zinc became widely used — bright plating, and semi-bright or matte zinc plating followed by a chemical polishing and lustre dip. Many proprietary bright dips were developed and are today widely used. One of these was patented.<sup>24</sup> *Gilbert and Hadden*<sup>25</sup> proposed other methods for protecting zinc against "white rusting," as well as explaining the corrosion mechanism.

*Soderberg*<sup>26</sup> made a systematic study of bath variables that affected the brightness of zinc deposits, and found that generally, high total cyanide and low caustic gave the most lustrous deposits. The widest C.D. range for bright deposits was obtained in a bath of 4.5 oz./gal. of zinc at 30-50 asf. This work is being continued.

Several patents for zinc solutions were granted. A British patent<sup>27</sup> for a bright bath containing chlorides and aluminum was granted. Another acid zinc bright bath was patented by *Faust* and his co-workers,<sup>28</sup> while *Chester*<sup>29</sup> obtained a patent on a semi-bright acid zinc bath.

A pyrophosphate zinc bath especially designed for plating on aluminum was patented by *Stareck and Passal*.<sup>30</sup> An immersion deposit from the usual zincate solution preceded the plating operation.

Towards the end of the year the high-purity zinc situation became very tight, and some reversal to cadmium plating was noted, as by that time the cadmium supply had improved greatly from the beginning of the year.

### Tin Plating

The development of a continuous strip process for depositing a different thickness of tin on one side of the strip than on the other side was probably the biggest development in tin during the year. This permits heavy coats inside of cans for maximum food protection, and thinner coats outside where it is of less importance.

The normal price of tin has always kept its commercial use as a plated coating rather limited, and the several price rises during the year did not help a bit. The international tin price finally got so high that even that traditional sucker, "Uncle Sam," stopped buying tin for its military stockpile. Restrictions on tin can be expected, therefore, to stifle any great developments in tin plating.

As a matter of record, several patents for tin plating processes were patented. An acid bath was attributed to *Allen*,<sup>31</sup> while a process for producing bright tin deposits from an alkaline stannate bath, using super-



Interest in the high temperature properties of plated coatings will be aided by the use of this hot-hardness tester developed at the Bureau of Standards.

imposed A.C. current, was granted a patent.<sup>32</sup> An immersion tinning process for steel was patented by *Harris*.<sup>33</sup>

### Silver Plating

Silver being one of the "have" metals in the U. S., and also widely used in aircraft bearings, it can be readily understood why there should have been increased activity in this field.

A lot of research went into the development of a bright plating bath, with at least one new proprietary bath<sup>34</sup> being made commercially available. A patent<sup>35</sup> was granted to *Wolfson* for a bright cyanide bath containing selenium as a brightener. A completely water-soluble double silver cyanide was made available to facilitate bath additions for silver platers.<sup>36</sup>

### Alloy Plating

One of the most promising developments in alloy plating last year was the tin-nickel plating process.<sup>37</sup> The brightness, pleasing color, ease of operation, and high tarnish resistance of the deposit make it very attractive for decorative applications. Only the high cost and availability situation on tin appear to stifle the rapid and widespread adoption of this process commercially as a bright finish, with or without a final chrome flash. The tin-nickel deposit contains 65% of tin and 35% of nickel.

There was a revival of interest in "white brass" (zinc-copper) plating, due to the unavailability of nickel. This is a process developed about 6 years ago,<sup>38</sup> but little used until the present interest. Used as an undercoat for chromium, it is very similar in appearance and tarnish resistance to nickel. Although used successfully for many items, certain bath variables hamper fuller utilization of the process.

A cyanide-tartrate bath for depositing copper-lead alloys was reported by *Ferguson and Hovey*.<sup>39</sup> Instability of the bath and certain other properties will need further study before the bath can become commercially important, however.

*Holt*<sup>40</sup> continued his investigations in alloy deposition, reporting on baths for plating binary alloys of rhodium with nickel, cobalt, and iron.

Several patents for alloy plating were granted. One was to *Jernstedt*<sup>41</sup> for a bright ternary copper-tin-zinc plate; another<sup>42</sup> was to *Boal* for a silver-lead alloy plating process. *Ruemmler*<sup>43</sup> patented a bath for depositing bright silver-antimony from a cyanide-tartrate system, while another patent<sup>44</sup> was granted for a lead-indium alloy bath using perchlorates of the metals. A wide range (1-90%) of indium in the deposit was claimed.

There was some indication during the year that alloy deposits of tungsten and other refractory metals were finding some commercial and military applications.

Substitution of an alloy deposit of copper 90% — tin 10% for pure tin as a stop-off for heat treating operations was reported by *Coe*.<sup>45</sup> Cheapness and conservation of tin were the principal advantages.

The weathering characteristics of tin-zinc coatings in comparison to zinc and cadmium were investigated by *Britton & Angles*.<sup>46</sup> They found that for suburban locations, the protection offered by equivalent thickness was in the descending order of zinc, 50/50 tin-zinc, 80/20 tin-zinc, and cadmium. For marine exposure the descending order 50/50 tin-zinc, zinc, 80/20 tin-zinc, and cadmium.

*Compton and Ehrhardt*<sup>102</sup> reported on the production of brass plating having a reproducible alloy composition over the range of 62-75% copper—balance zinc. They found that the high metal—high pH bath could be worked over a current density range of 25-125 a.s.f. to give alloys of uniform composition over this copper content range.

#### Miscellaneous Metal Plating

Evidence was prevalent last year that the whole field of common and rare metals is being carefully scrutinized for electrodeposition possibilities. Germanium,<sup>47</sup> zirconium,<sup>48</sup> selenium,<sup>49</sup> were among those investigated.

*Bregman*<sup>50</sup> proposed the use of antimony plating as a substitute for nickel-chrome, because of its high tarnish-resistance, salt spray resistance, solderability, and general corrosion resistance. Two baths are available for antimony plating. A patent<sup>51</sup> was granted to *Chester* for using superimposed A.C. current for plating antimony from a trichloride bath, wherein better uniformity of the coating is claimed.

The search for a commercially practical method for plating aluminum on steel was reported to be near a successful conclusion.<sup>52</sup> *Hurley & Weir*<sup>53</sup> developed a low temperature (125°C.) fused salt bath for depositing aluminum, as well as a room temperature organic-solvent bath used with superimposed A.C. to produce bright, ductile deposits. *Couch and Brenner*<sup>54</sup> also developed a non-aqueous bath for depositing thick, ductile aluminum, but in their case some trouble with adhesion was experienced.

Several patents in this field were granted, one<sup>55</sup> for

indium plating from a cyanide bath, one for iron,<sup>56</sup> and one for manganese.<sup>57</sup>

#### Anodic Coatings

While there was undoubtedly a great deal more production activity in the anodizing field last year, about the only development of any importance was the announcement of a new process<sup>58</sup> for magnesium which gave a very hard, adherent anodic oxide coating. The process is available to those producing on government contracts. Several patents for magnesium anodizing were granted. One of these<sup>59</sup> was for an anodic treatment in a manganese chromate bath, while *Cutter*<sup>60</sup> patented a caustic anodize-coloring process.

*Durkin*<sup>61</sup> showed how sealing of anodized aluminum in pH controlled water (pH 6) increased the corrosion resistance about 35% over sealing in uncontrolled tap water. Processing aluminum sheets to produce a glossy surface on one side and a matte surface on the other (both of which could be dyed) was the subject of another patent.<sup>62</sup>

A method for regenerating anodizing solutions, thereby saving chromic acid and reducing waste disposal problems, was patented by *Borngesser*.<sup>63</sup>

A method of producing anodic coatings on titanium was proposed by *Ma & Peres*,<sup>64</sup> and its resistance to corrosion by various agents was studied.

#### Conversion Coatings

The field of chromate and phosphate type coatings was undoubtedly one of the most active during the past year. Today there is hardly a zinc or cadmium plating line that does not incorporate a final chromate dip, either to condition the surface for painting, or as a final brightening, passivating treatment. In the latter case a clear coating of lacquer forms the protective topcoat. Early in the year there was considerable interest in the automobile industry in using lacquered bright zinc as a replacement for nickel plating, and although this has been used successfully in some instances it is not generally considered entirely suitable. Once the protective lacquer and passive film have been pierced, which is not too difficult, there is the inevitable bulky white corrosion typical of zinc. Also, there are many instances where a lacquer film is objectionable, so that the chromate film alone must do the entire job of protecting the zinc. In this case the clear lustrous films, which are quite thin, do not give the necessary life for any but the mildest conditions. The heavier colored chromate films, when they can be used, do give substantial protection.

One new commercial chromate process<sup>65</sup> was announced, in which dyes could be used to give a range of colors.

Although phosphating use showed a decided increase during the year, due to expanding military production of painted items, nothing of outstanding importance in this field was noted.

#### Special Surface Treatments

A number of interesting and potentially useful surface treatments other than plating were brought out over the past year. One of the most promising is a method for infusing chromium into steel to provide a substantially pure chromium surface. *Galmiche*<sup>85</sup> de-





An intensive search was made during the past year to find suitable alternate finishes for automobile components such as the bright trim shown above.

scribed a process for putting a very bright chromium coating on steel with chromium fluoride vapor at high temperature, while a patent was issued to *Ruemmler*<sup>86</sup> for a combined plating-heat treating process for chromizing.

A detailed study of the zincate process for plating on aluminum was made by *Bailey*,<sup>87</sup> and optimum conditions were determined for obtaining maximum adhesion for various conditioning procedures, alloy compositions and heat treatments. A patent was issued to *McDermott*<sup>88</sup> for a pickling-anodizing-plating process for aluminum.

A blackening bath for aluminum, consisting of a hot aqueous solution of ammonium molybdate and ammonium chloride, was patented by *Lewis & Collar*.<sup>89</sup> *Schneider*<sup>90</sup> described a method for obtaining a quick patina on copper and bronze, involving heating and swabbing with chemical solutions.

Plating nickel over soft-colored joints by anodic pre-treatment in phosphonic-sulfuric acids was the subject of a patent<sup>91</sup> granted to *Stoddard*, while chrome plating over carbon was patented by *Herwig*.<sup>92</sup>

#### Testing and Analysis

A study of the various methods for determining the thickness of nickel and copper coatings on steel was made by *Read*.<sup>93, 94</sup> He found that the Magne-gage, BNF Jet Test, microscopic, and stripping methods were reproducible enough for most purposes, and gave sufficient accuracy when properly calibrated. Some discrepancy was noted for the microscopic method when thin deposits were being checked. Apparently there is some question as to whether the microscopic method is the best one to use as a reference standard for all thicknesses; it is currently part of A.S.T.M. standards for plating.

A simplified apparatus<sup>95</sup> was brought out for rapidly measuring the surface tension of plating baths, which can be used by the plater at the tank for control purposes.

A number of new analytical chemical methods were

reported during the year, amongst which were methods for iron in chrome baths<sup>96</sup> by centrifuging, lead in zinc baths<sup>97</sup> (colorimetric), and zinc and cobalt in gold alloy baths<sup>98</sup> (colorimetric).

The growing interest in the use of plated coatings at high temperature was aided by the development of an instrument for measuring the hardness under such conditions.<sup>99</sup>

#### Equipment

Among the new items of equipment worthy of special mention is the growing use of unplasticized polyvinyl chloride plastics for tank liners, fume ducts, piping and valves, etc. Besides solving a conductivity and metal shortage problem, these materials are giving extra long life in highly corrosive atmospheres. Plastic impregnated fiber glass is also finding similar applications.

Dynel cloth, one of the newest synthetic fibers, is showing promise for use as diaphragm material in plating tanks, overcoming the early deterioration of canvas duck materials. Some weaving problems still exist with Dynel before it can be used as a pressure-filtering medium, however.

#### Cleaning and Degreasing

There was a noticeable trend away from the use of chlorinated solvents, substituting emulsifiable soak cleaners and di-phase cleaners instead. Price, supply, and operating hazards are all factors in this movement.

An A.E.S. research project made numerous reports on cleaner evaluation work it is undertaking. A new test specimen has been proposed, but the results of the project have not yet been summarized. The A.S.T.M. has also proposed tentative specifications for testing the rinsability and buffering action of metal cleaners.<sup>100</sup>

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# Windy City Branch Hosts For 1952 Convention and Exposition

**T**HE 1952 Convention of the A.E.S. to be held in Chicago June 16-20, will again feature the Third Industrial Finishing Exposition, the first to be held since the Atlantic City Exposition of 1948.

This Exposition is expected to attract the exhibits of nearly every manufacturer and supplier in the metal finishing field, and visitors will have an opportunity for discussing and having demonstrated for them the latest in metal finishing materials and equipment. A great many new developments have taken place in the 4 intervening years between expositions, so that all who attend or exhibit will be able to synchronize their knowledge of what has come along in recent years.

The Exposition will be held at the International Amphitheatre (Stockyard arena, if you prefer), with special buses to transport you to and from the Conrad Hilton Hotel (former-



Clyde Kelly, General Chairman of the  
1952 A.E.S. Convention.

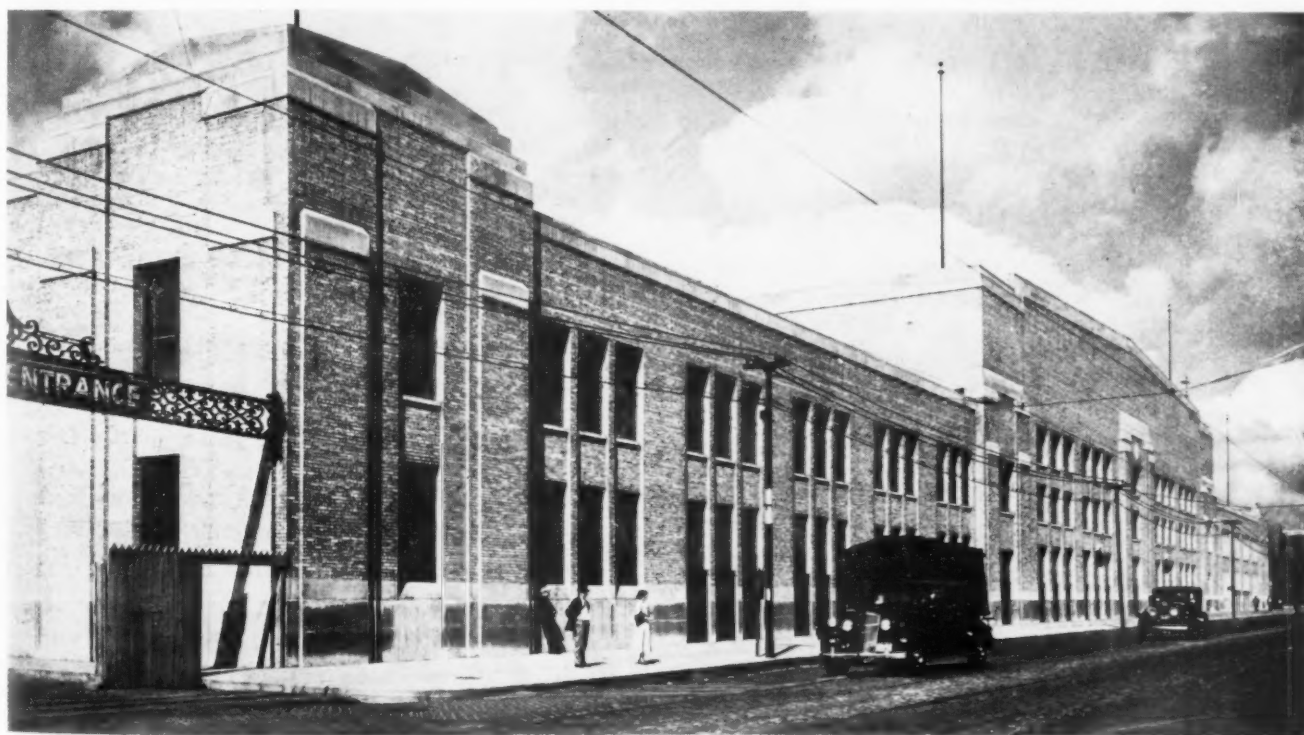
ly the Stevens), which will be the headquarters hotel. Meeting place for all technical sessions will be the famous

Stockyards Inn, adjoining the exhibits building, where one can fill up on tender, juicy sirloin steaks to build up energy for the week's social and technical whirl. Also nearby is Comiskey Park, home of the Chicago White Sox, where night baseball will be played during convention week.

In addition to these, of course, are the other attractions for which Chicago is famous. Those who know will tell you that no other metropolis in the world can offer the same wide range of interests and diversions as the "Windy City," and anyone who couldn't enjoy himself there would have to be completely hopeless.

Those who bring their cars to Chicago will appreciate the free, lighted parking space for 4,000 automobiles at the exhibit hall.

Remember these dates, June 16-20, and plan to be in Chicago with the best of the country's metal finishers.



International Amphitheatre at the stockyards, Chicago, where the Finishing Exposition will be held.





The new home of the Nutmeg Chrome Corp. in West Hartford, Conn.

## Successful Hard Chrome Plating

### The Story of Nutmeg Chrome Corp.

**"T**YPICAL Connecticut Yankee" comes as close as it is possible to describing the history of the *Nutmeg Chrome Corp.*, of Hartford, Conn. Founded as a two-man shop only 7 years ago in the highly specialized and exacting field of hard chrome plating, its business and reputation have grown at a steady rate until it now occupies its own new building and keeps 13 employees busy.

From the very start, the company has preferred to concentrate and specialize in chrome plating only, and the firm's reputation as a master in the hard chrome plating field is evidenced by the fact that intricate dies, molds, tools (as well as some exceptionally tricky decorative jobs) are shipped there from all sections of the country, and even visitors come from foreign lands to see how things should be done. It is probably one of the best known and often visited job plating shops in the world!

The story of Nutmeg Chrome Corp. is very largely the story of its friendly founder and owner, "Art" Logozzo. Art is as well known as his firm, for he has just completed five years of outstanding service to the plating industry as an executive officer of the American Electroplaters' Society. Building up a business while at the same time devoting a good deal of time to Society affairs, including a visit to almost every American Branch of the A.E.S., takes a lot of energy and interest, both of which Art has in abundance. He also possesses that rare combination of optimism, mechanical ability, inquisitiveness (some call it "noseyness") and open-mindedness so essential to success and peace-of-mind in a field which can often border on exasperation. A look at the top of Art's head is proof enough of how hectic things can and do get!

Art's plating career started in 1929 with the Conn. Electric & Telephone Co., in Meriden, where he gained

experience with a wide variety of plating baths, including the first chrome bath in that area. From there he went with the International Silver Co., where he operated their chrome tanks, as well as the first commercial cobalt-nickel bath ever installed. From 1934-1938 he was with *Pratt & Whitney*, where he specialized in hard chrome plating of small tools, dies, and gauges. In 1939 he joined General Electric's Pittsfield plastics plant, the largest plastic molding plant in the world, where he concentrated on the plating of plastic dies and molds of all types and descriptions. He left G. E. for a job with *Hartford Chrome Co.*, where he stayed for 2 years, then joined *MacDermid, Inc.* as a technical service engineer. It was in December, 1944 that he decided to fend for himself, when he started the Nutmeg Chrome Corp. at the old address on Chapel St., Hartford.

For the present, Art feels that in his new plant he is finally "at home." Says Art "We hope we never have to expand — improving our present operations is our main objective."

After the new building was built it was equipped by Art and his employees, the work being carried on between regular stints at the old plant. The beautiful driftwood-panelled office is itself pretty good evidence that the firm is endowed with lots of talent and co-operative ability other than platingwise. Nutmeg Chrome has a profit-sharing plan for all employees, and a minimum of labor-turnover. In fact, working with Art must be pretty satisfying, for in seven years he has only had two key employees leave. One of these went to manage some property left to him, the other to go into the real estate business. Not a bad record for a type of work that is ordinarily notorious for trying working conditions.

(Concluded on page 70)



Figure 1. The "boss man" where you will find him the least—behind his desk. That's his commission in the "Order of The Pot" on the desk in front of him.

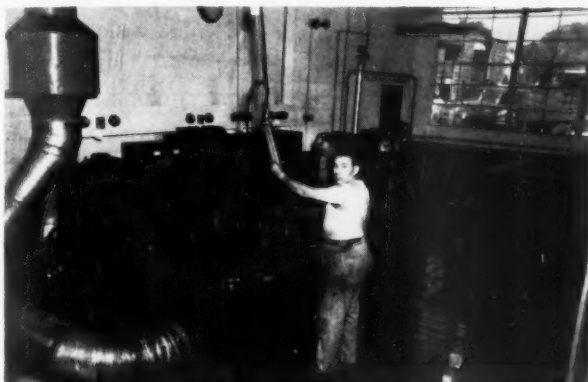


Figure 2. The heart of the plant is this chrome tank, used for both hard chrome and decorative plating. Several jobs can be run in the one tank independently of each other.

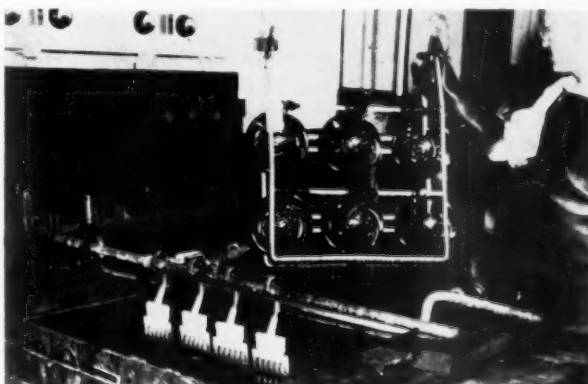


Figure 3. One of the several decorative chrome jobs done at Nutmeg is this flash reflector, where deep throwing is required.

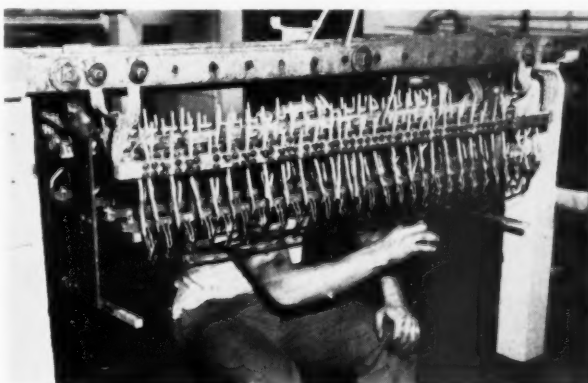


Figure 4. Special racks for production hard chrome plating often look like something from another planet. This one is typical, plating 100 pieces at a time.



Figure 5. A great deal of hand work goes into the polishing and surfacing of dies and molds both before and after hard chrome plating. This well-lighted work area is the busiest in the shop.



Figure 6. Close-up of hand working operations, using a flexible shaft machine and formed bobs for polishing mold cavities to a high finish.

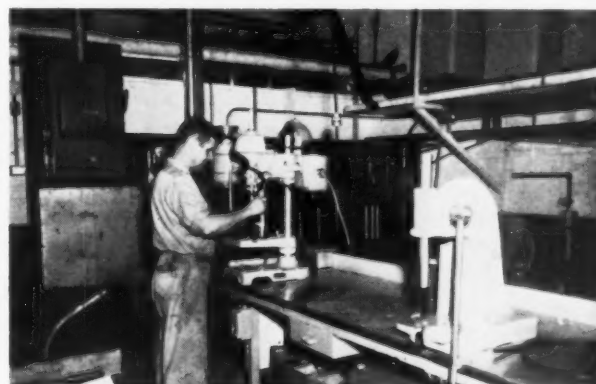


Figure 7. Plating racks and fixtures are made and maintained in Nutmeg's own shop, which is completely equipped for this purpose.

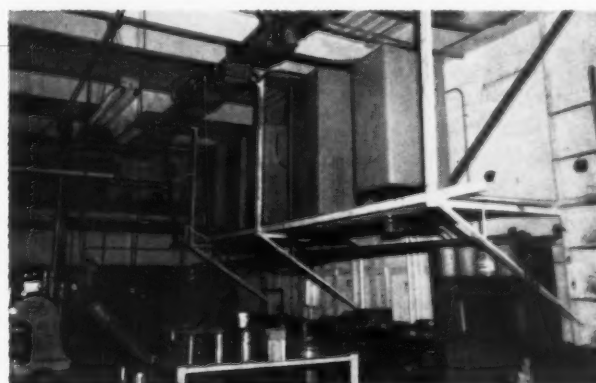


Figure 8. Power for all plating is supplied from these rectifiers, mounted overhead in a clean, easily accessible place. Bus bars run down the wall to underfloor tunnels to each tank.

# Dragout Control—Part III

By Joseph B. Kushner, Director, Kushner Electroplating School, Stroudsburg, Pa.



IN the second part of this paper we considered the physical factors that effect dragout with a view towards controlling and reducing dragout loss at its source. In this third and final part, we will examine methods for recovering part or all of this loss, once it has occurred.

## Recovery at the Plating Tank (Sprays)

To reduce dragout loss, work leaving the plating tank may be washed or sprayed down before it crosses the tank edge. There are several different types of sprays that may be used to accomplish this. Water, air, water and air combined and steam may all be used.

With water sprays, the amount of water that can be used to spray the work is contingent on the water loss rate (evaporation rate) of the plating tank, inasmuch as the washings drip down into the tank. Accordingly, the spray is usually operated intermittently through a timing circuit so that a minimum of water is used. If even then too much water is used, it is possible to combine the water jets with air to further lower the water volume and still produce good results.

Air is sometimes used by itself for blowing off clinging liquid but the writer believes this is not too satisfactory a method, since a considerable part of the liquid may be carried away by the air stream and a powerful drying or "freezing" effect is exerted on the liquid film, which hinders its drainage.

The use of steam jets for washing down the work before it crosses the tank edge would seem to offer an excellent means for recovering some of the dragout. The steam, by raising the temperature of the liquid film, materially decreases its viscosity, thus promoting rapid drainage. In connection with reduction of dragout film viscosity, it should be mentioned that where water sprays are used, the hotter the water, the better the results as far as dragout recovery is concerned.

Sprays, while excellent in reducing dragout losses, may not be able to reach certain areas of intricately-shaped objects. Further, they may not have enough time in which to act and the amount of water used may greatly exceed the tank evaporation rate if water flow is increased to shorten the time of spraying. For this reason, sprays alone cannot do the best possible recovery job, and a tank recovery system must be used for maximum results.

If the work is now to be moved over the plating tank

edge to a recovery tank, the obvious thing to do is to provide a drainboard or spillway beneath the path of the work, of non-contaminating material, and so pitched that whatever liquid falls from the work will run, or can be washed, back into the plating tank.

## The Drip Tank

Where the nature of the work is such (a plating barrel, for example) that there is continuous dripping over an extended period of time, a drip tank is of considerable help. This consists of an ordinary tank of non-contaminating material, in which the work may hang indefinitely while plating solution drains off. In the case of plating barrels, the barrel can rotate while draining, to insure maximum drainage. The drips, when they have added up to a sizeable volume at the bottom of the tank, can then be returned to the plating bath at a convenient time.

## "Fog" Spray Tank

A variation of the drip tank is the fog spray\* tank. With a fog spray tank, the work is sprayed with a mist-like type of water spray. The water is so finely atomized that very little water is used. The "fog" condenses on the work to dilute the plating solution film and speed its drainage. It is claimed that because of the vaporous nature of the spray, even inaccessible surfaces are reached so that an object can be thoroughly stripped of its dragout film. Since only a small amount of water is used in producing the "fog," a fairly concentrated solution results at the bottom of the tank, which solution may be pumped back to the plating tank or stored for recovery or treatment. The drawbacks to this

\*"Fog" type nozzles are often used for spraying work over the plating tank.

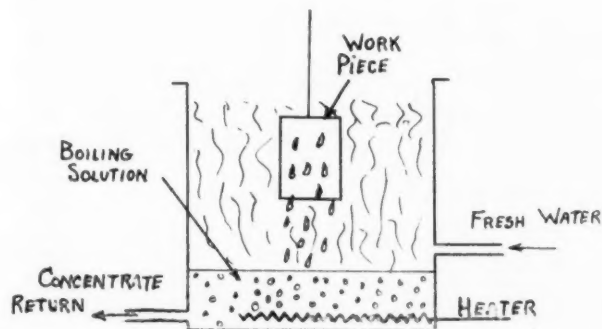


Figure IX. A "desalter" tank operates on the same principle as a vapor degreaser.



method of recovery are that it cannot remove plating solution that is trapped in hollows and that the work must hang for a considerable period of time before most of the dragout film is washed down.

### The Desalter Tank

A possible arrangement, if time is not too great a factor, is to use a tank such as illustrated in Fig. IX. A layer of water maintained at a constant level is kept at the boiling point by means of a steam coil. The work coming from the plating bath is held in the vapors rising from the boiling water. The steam condenses on the cooler metal surfaces and washes the salts in the dragout film down into the main body of water, which is continuously pumped back into the plating tank. This, as can be seen, is essentially the action of a degreaser, except that we can call it a "desalter." Like the "fog" spray tank however, it cannot remove plating solution that is trapped in hollows in the work.

### Recovery Rinse Tanks

Where time is important, or where the work is such that it has non-draining areas, or where a maximum amount of dragout recovery is demanded, recovery rinse tanks are used. The recovery rinse tank is essentially a tank filled with pure water (in certain cases it may have to be slightly acidulated or alkalized to prevent hydrolysis or other undesirable effects).\*\* The work enters this tank immediately on coming from the plating tank or drip tank and the water in it makes positive contact with every part of the dragout film, diluting it. If the work is agitated or the water is agitated, most of the salts in the dragout film will be diffused into the main body of water, particularly if the water is hot (see previous remarks regarding viscosity, which greatly effects the diffusivity of the plating salts). After a period of operation, the highly diluted plating salts in the dragout tank can be concentrated by evaporation or by ion exchange methods and returned to the plating tank or otherwise reclaimed. One or more of these tanks may be used in series to obtain greater efficiency in recovery.

### Non-Equilibrium Recovery (Stagnant Tanks)

The common recovery method used, in which the recovery tanks are stagnant (no fresh water flows into them continually) is a non-equilibrium method of recovery; that is, the concentration of salts in the tanks is continually changing with time.

The theory of single and multiple stagnant dragout tanks has been adequately discussed in previous papers<sup>8</sup> so that it need not be presented here. In general, the build-up of plating salts in a single stagnant dragout tank, is given by the relationship,

$$(14) \quad C_t = C_0 (1 - e^{-\Theta t/V})$$

where  $C_t$  is the concentration of salts in the dragout tank after a period of time  $t$ ,  $C_0$  is the concentration of salts in the plating tank (assumed to remain constant),  $\Theta$  is the dragout volume per unit time,  $V$  is the volume of the dragout tank, and  $e$  is the constant, 2.718.

\*\*The addition of a suitable wetting agent to improve rinsing characteristics is also sometimes practiced.

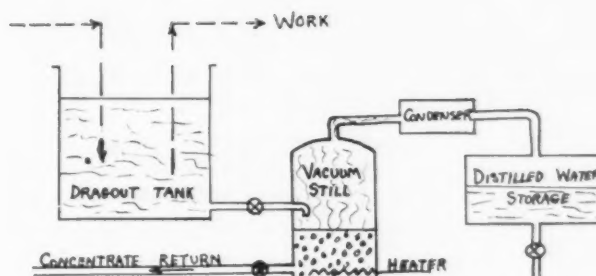


Figure X. Illustrating a vacuum evaporator system using the batch method.

The more frequently used alternative form of this equation is

$$(15) \quad C_n = C_0 (1 - e^{-\Theta n/V})$$

where  $C_n$  is the concentration in the dragout tank after  $n$  loads have gone through it,  $C_0$  has the same meaning as before,  $\Theta$  is the average dragout per load,  $n$  is the number of loads, and  $V$  has the same meaning as before.

Where two such tanks are used in series, the concentration of salts in the second rinse tank is given by

$$(16) \quad C_2 = C_0 (1 - [1 + \Theta n/V] e^{-\Theta n/V})$$

Where three tanks are used in series (the maximum number recorded in the literature — used in production gold plating<sup>9</sup>), the concentration of salts in the third tank is given by

$$(17)$$

$$C_3 = C_0 \left( 1 - \left[ 1 + \frac{\Theta n}{V} + \frac{1}{2} \frac{(\Theta n)^2}{V^2} \right] e^{-\Theta n/V} \right)$$

As the number of stagnant tanks goes up, the term in the brackets approaches  $e^{\Theta n/V}$  so that the product of  $e^{\Theta n/V}$  and  $e^{-\Theta n/V}$  is equal to unity and thus the concentration of salts in the  $m$ th tank, where  $m$  is a very large number, is equal to zero.

It will be noted that the equations given presuppose a continuous process, a justifiable assumption in modern production plating where many loads of work pass through the plating and dragout tanks during the course of the day. For an analysis on the basis of a stepwise process, the reader is referred to this writer's paper in *Metal Industry*, Jan. 1935.<sup>\*\*\*</sup> At any rate, both that analysis and the one based on the assumption of a continuous process, indicate that after a period of time,  $C_n \rightarrow C_0$ , which means that if the dragout water is not changed often enough the concentration of salts in the dragout tank approaches that in the plating tank. Indeed, if evaporation losses in the dragout tank are not replenished as well, the concentration of salts in the dragout tank may go higher than in the plating tank and the dragout tank is then worse than useless!

To recover the salts held in dilute form in the stagnant dragout tank several approaches are possible: 1) The solution from the dragout tank can be gradually

\*\*\*For the stepwise process, for 1 dragout tank, the result is  $C_1 = C_0 (1 - [1 + \Theta/V]^{-n})$

added to the plating tank to replenish evaporation losses there. 2) The solution in the dragout tank can be concentrated by evaporation and restored to the plating tank in total, at regular intervals.

The first method is the oldest method. It has been practiced since the early nineteen thirties with gold and other precious metal plating solutions. One or more dragout tanks are used in series. When some water evaporates from the plating bath, this loss is replenished with solution from the first dragout and the loss in the first dragout is replenished with solution from the second dragout, and so on down the line until the last dragout tank is reached, which tank is replenished with fresh water.

While in principle the idea is good, in practice it is usually performed in such desultory fashion that little if any good is accomplished. An irregular cycle is followed, with solution evaporation loss in the plating tank replenished in a haphazard manner from the dragout tanks; the dragout tanks are permitted to go unattended for long periods of time, so that the solution in them concentrates through evaporation and impurities accumulate through carelessness. In the end, little metal is saved and the plating bath may itself become contaminated. Because of this, many gold platers desisted in this practice. Instead they pour off the contents of the first dragout tank into a "boildown" tank at regular intervals.<sup>9</sup> They concentrate the salts by boiling off the water, then precipitate the gold. This method, while it saves some of the gold, is still highly inefficient because of the extra time, labor and supply loss involved. The gold saved this way must ultimately go back into the plating tank. This being the case, there is a double expense in decomposing the gold solution to get the gold, then dissolving the gold to get back the gold solution!

#### Evaporation and Return Method

This method of recovery, which has only recently come into use, offers a far more efficient approach to the problem. A typical example of this method is shown schematically in Figure X. The system, which has been put into successful use for chromium and nickel dragout recovery,<sup>10</sup> utilizes a vacuum evaporator for concentrating the dragout solution. When the concentration of salts in the dragout solution reaches a predetermined value, the dragout solution is fed to the evaporator and distilled water from a previous batch replaces the old dragout solution. The concentrate resulting from the evaporation is then fed back to the plating tank to make up for evaporation losses there. Figures given by *Neben & Swanton*<sup>10</sup> with regard to chromic acid recovery indicate that in many cases the cost of the evaporator and auxiliary equipment can be paid off in short order from the savings made. A rather remarkable example cited by *Rominski and Clifton*<sup>11</sup> showed that in one case about 90% of the total amount of chromium that had been previously used in a radiator grille plating operation was salvaged by the use of a system of this type. (More chrome was disappearing by dragout than by plate out!) This method should find wide application, not only in chrome and nickel

plating, but in production gold plating as well, inasmuch as the evaporation takes place under vacuum so that the gold solution can be concentrated at a temperature lower than that used in the plating tank itself, thus minimizing the possibility of decomposition.

Before leaving the subject of stagnant dragout tanks, two questions that are sometimes asked about them, should be answered. The most common one is: In a plating line, if there is room only for a dragout tank of volume  $V$ , would there be any advantage in using two dragout tanks of volume  $V/2$  each, provided the work would fit into them? The answer to this is that there is a definite advantage to using the two tanks of volume  $V/2$  each, provided that the tanks are emptied at any time between  $n = .5V/\Theta$  and  $4V/\Theta$ . If this is done, the two tank system will collect on the average of about 12% more salts than the one tank system. To balance this saving, however, there is the cost of the extra dipping operation to be considered.

The second question that is asked is: Will it pay, if I have the room for it, to use two dragouts instead of one? The answer to this is obviously yes. Thus with two tanks of volume  $V$  each as compared to one of volume  $V$ , when the number of loads,  $n$ , has become equal to  $V/\Theta$ , the two-tank system has saved roughly ten times as much material as the one tank system. Thus a double dragout when used in conjunction with a vacuum evaporator like the one mentioned previously, permits the evaporator to be much smaller in size to accomplish the same recovery job. Three dragouts will be even more effective in this connection, but above this number we begin to meet the effects of the Law of Diminishing Returns.

#### Equilibrium Recovery Methods (Running Dragout Tanks)

Where there is a constant flow of fresh water to the dragout tank (and a constant outflow of dragout solution) an equilibrium or "steady state" condition is soon reached in the dragout tank, with regard to the concentration of the dragout solution. If the outflowing solution from the dragout tank can be pumped back directly to the plating tank or can be processed in some way so that the plating salts are extracted from it, we have an equilibrium recovery method. There are two principle means for accomplishing this: 1) Ion Exchange, 2) Evaporation.

#### Ion Exchange Method

The ion exchange method is illustrated diagrammatically in Figure XI, in conjunction with a nickel plating

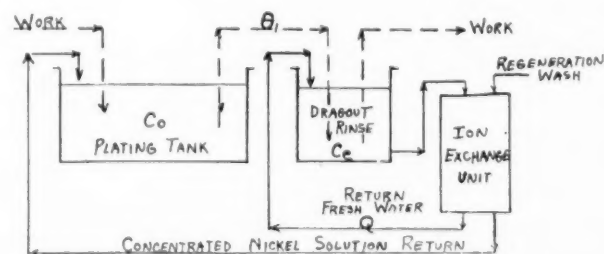


Figure XI. Utilizing an ion-exchange recovery method for lessening dragout loss.

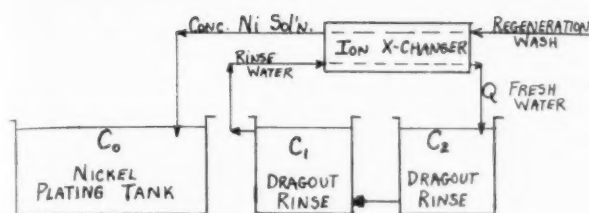


Figure XII. A two-tank ion exchange recovery system.

operation.<sup>12</sup> The nickel dragout, highly diluted by the dragout tank water, is continuously passed through an ion exchanger. Nickel ions are accumulated in the cation exchanger and pure water is returned to the dragout tank. After a period of operation, the process is shut down and the nickel is backwashed out of the cation exchanger as pure, concentrated nickel sulfate solution. This may be crystallized to obtain the solid salt, which can be sold or returned to the plating bath, as desired.

If  $Q$  is the flow rate of the ion exchanger in gallons per hour and  $\Theta_1$  is the dragout in gallons per hour, then the equilibrium concentration of nickel salts in the dragout tank is given by

$$(18) \quad C_1 = \frac{C_0 \Theta_1}{Q + \Theta_1}$$

where  $C_0$  is the concentration in the plating tank.

If two dragout tanks are connected in series as shown in Figure XII, then the equilibrium concentration in the second tank is given approximately by

$$(19) \quad C_2 = \frac{C_0 \Theta^2}{(Q + \Theta)^2}$$

And with  $m$  dragout tanks, the equilibrium concentration in the  $m$ th tank would be given approximately by

$$(20) \quad C_m = \frac{C_0 \Theta^m}{(Q + \Theta)^m}$$

Thus it is possible, by using more than one tank in series, to reduce the size of the ion exchanger required, or with a given sized ion exchanger to recover a greater amount of metal.

The method is very clever. However at the present time it is limited to one or two types of ion recovery only, which means that the other salts in the plating bath go to waste and/or present a sewage problem. It is not beyond the realm of possibility however that an ion exchange system can be developed to strip a dragout solution of all valuable and nuisance components.

### Evaporation Method

If the evaporation rate of the main plating tank is sufficiently high, it is possible to continuously feed dragout solution back to the plating tank and to replenish the dragout tank with fresh water at the same rate.<sup>13,14</sup> This leads to an equilibrium recovery system that is superior to all others from the standpoint of economics, inasmuch as no costly evaporators or ion exchangers are required.

As indicated by Figure XIII, if the plating tank

evaporation rate is  $E$  gallons per hour and the dragout rate is  $\Theta$  gallons per hour,\*\*\*\* the equilibrium concentration of plating salts in the dragout tank will be given by

$$(21) \quad G = \frac{C_0 \Theta_1}{E + \Theta}$$

just as in equation 18.

If the evaporation rate is large enough, as shown previously, in the  $m$ th dragout tank the equilibrium concentration of salts will be equal to

$$\frac{C_0 \Theta^m}{(E + \Theta)^m}$$

Further if  $\Theta$  is quite small as compared to  $E$ , the  $\Theta$  term can be dropped in the denominator, and the equilibrium concentration is equal roughly to

$$C_m = C_0 \frac{\Theta^m}{E^m}$$

This being so, the fraction of dragged out salts recovered by the system is equal to

$$(22) \quad R = 1 - (\Theta/E)^m$$

It is possible, therefore, provided the tank evaporation rate is high enough, to design a recovery system which will return practically all the salts that are removed from the plating tank thus leaving no sewage or waste problem to contend with!

For example, if the evaporation rate is ten times greater than the dragout rate, the fraction recovered will be equal to  $1 - (1/10)^m$ , and for a three tank system this amounts to .999!

If the evaporation rate is not very high it is still possible to use such a system, but the number of tanks used to retain a definite fraction of the dragout loss is greatly increased, since now  $C_m$  no longer is equal to  $C_0(\Theta/E)^m$ . Instead it will be found that when the evaporation rate is close to the dragout rate that

$$(23) \quad C_m = \frac{C_0 \Theta^m}{(E + \Theta)^m - F \cdot (E \Theta)}$$

where  $F \cdot (E \Theta)$  is a function of  $E$  and  $\Theta$ .

Thus, for a two tank system

$$C_2 = \frac{C_0 \Theta^2}{(E + \Theta)^2 - E \Theta}$$

and for a three tank system

$$C_3 = \frac{C_0 \Theta^3}{(E + \Theta)^3 - 2E \Theta (E + \Theta)}$$

If the evaporation rate is equal to the dragout rate, a one tank dragout will retain .5 of the loss, a two tank

\*\*\*\*Based on the assumption that work is continually moving in and out of the dragout tank as in wire, strip and automatic plating.



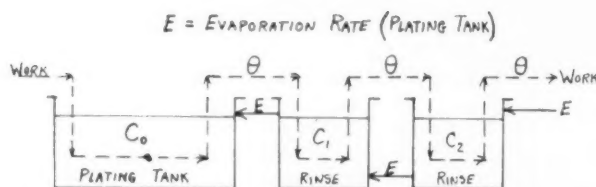


Figure XIII. Evaporation return method for replacing dragout in the plating tank.

system will retain .67, and a three tank system will retain .75. With an evaporation rate ten times as great as the dragout rate, a one tank system will retain .90 of the loss, while an eight tank system would be required to retain the same fraction if the evaporation rate equaled the dragout rate!

### Evaporation Rates and Dragout

It can be seen from the foregoing that the evaporation rate of the plating bath plays an important role in the recovery of dragout losses. It is important not only in the equilibrium method just given but in the non-equilibrium methods as well, for if the evaporation rate is high a larger quantity of solution from the stagnant dragout tanks can be returned to the plating tank in a given period of time, which automatically increases the efficiency of the operation and permits the use of smaller vacuum evaporators, etc. This being the case, the process of plating tank evaporation merits our consideration.

A typical equation found in the literature<sup>14</sup> for the evaporation of water from brine solutions in open tanks is given by

$$(24) \quad E = A (k + cu) (p_b - p_a)$$

in which  $E$  is the total evaporation in lbs. per hour,  $A$  is the area of the free tank surface,  $k$  is a constant,  $c$  is a constant,  $u$  is the velocity of the air above the free solution surface,  $p_b$  is the vapor pressure of the solution at its operating temperature, and  $p_a$  is the partial pressure of the water vapor in the air above the solution.

From this equation we can see immediately what factors effect the evaporation rate, and how it can be increased. The term in the parentheses ( $p_b - p_a$ ) depends on the temperature of the plating solution, the air humidity and temperature, and the barometric pressure. Once the temperature of the plating solution has been increased to its optimum value, little can be done about increasing the value of  $p_b - p_a$  outside of air conditioning. The open tank area,  $A$ , is usually fixed and kept as small as possible to minimize expenses, so not much can be done here. On the other hand, the expression ( $k + cu$ ) contains the variable  $u$ , which can be readily and easily controlled to increase the evaporation rate. No work, as far as this writer knows, has been done on plating solutions in this connection. Occa-

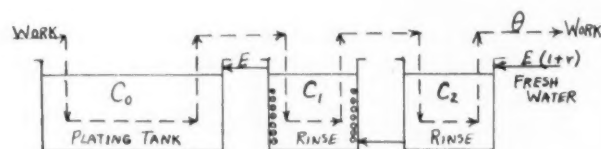


Figure XIV. Using a heated dragout rinse system.

sional mention is made in the literature that plating tank slot ventilation seems to greatly increase the evaporation rate of plating baths but no actual figures are given. Work done with brine solutions indicates that moderate air velocities (not greater than 15 ft. per second) can readily quadruple the evaporation rate.\*\*\*\*\* It should be possible therefore, by using slot ventilation and sufficient air velocity, to considerably increase the evaporation rate at the plating tank.

If the evaporation rate cannot be made to greatly exceed the dragout rate at the plating tank, there are devices or stratagems which may be used that will in effect, give the equivalent result of a rate increase, so that an equilibrium recovery system can be used. The simplest device is that shown in Figure XIV, and consists of using at least two dragout tanks, one of which is heated so that a large amount of water evaporates from it.

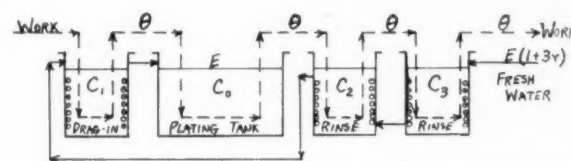


Figure XV. A hot drag-in tank prior to the plating tank. See text for description of operation of this system.

Thus for a two-tank system, if the evaporation rate in the plating tank is  $E$  and the evaporation rate in the heated dragout tank is equal to  $rE$ , the equilibrium concentration in the second dragout tank is equal to

$$(25) \quad C_2 = \frac{C_0 \Theta^2}{(E + \Theta)(E' + \Theta) - \Theta E}$$

where  $E' = E(1 + r)$ . If two heated tanks are used along with a cool one, the equilibrium concentration in the third tank is equal to

$$(26) \quad C_3 = \frac{C_0 \Theta^3}{(E + \Theta)(E' + \Theta)(E'' + \Theta) - 2\Theta E(E + \Theta)}$$

where  $E'' = E(1 + 2r)$ .

To give an example, suppose the evaporation rate from an automatic plating tank is 10 gallons per hour and the dragout rate is 8 gallons per hour. If two heated dragouts are used (each provided with ventilation so that the evaporation rate in each is 10 gallons per hour), along with a cool dragout, the equilibrium concentration in the third tank will be approximately

$$\frac{C_0 8^3}{18 \times 28 \times 38 - 18 \times 160} = .016 C_0$$

And the fraction of the dragout loss recovered will be

\*\*\*\*\*Too high an air velocity must be avoided in order to prevent spray and spray loss. (A mist entrainer or washer such as is sometimes used with chrome plating baths can save whatever small amount is blown away by the air stream if very high velocities are used).

(Concluded on page 74)

# Insulation for Plating Racks

By J. A. Williams, *United Chromium, Inc., New York, N. Y.*



WHEN requested to write this article, our first reaction was "Why write it? Everybody knows about rack coatings." However, a little questioning brought out the fact that many platers have only vague knowledge about the various types of rack coatings, their properties, advantages, and disadvantages. This situation exists because

there has been relatively little published about this important subject.

Rack coatings are very important tools of the plater. They help to reduce costs; they conserve strategic and costly metals; they improve plating quality. For these reasons, it is especially important that platers be well informed at this critical time.

## Necessary Properties

To prove suitable for rack coating purposes, a material must possess unusual chemical and physical properties. The material must not injure or contaminate any solution it enters. It must be resistant to both acid and alkaline solutions, many at temperatures close to boiling. The material must withstand powerful oxidizing agents such as chromic acid and nitric acid bright dips. For some applications, it must also be resistant to vapor degreasers. Physically, the material must be able to withstand relatively high temperatures without softening or sagging. Rapid temperature changes, such as occur in transfer from a hot solution to a cold running water rinse, must not affect the material. It must be smooth so that solutions will rinse freely from it. A rack coating must have good adhesion and be flexible so that it will not pull away from the rack or crack when spring contacts are compressed. Furthermore, it must have the toughness and resiliency to withstand mechanical abuse. Last, but not least, the material must have good electrical insulating properties.

In the history of electroplating, many materials have been tried as rack coatings but few have proved suitable. Those that have met with the greatest acceptance are rubber coatings, tapes compounded from a few selected resins, hot-dip materials such as wax, and solutions and dispersions of certain types of chemically-resistant synthetic resins.

## Rubber Coatings

Rubber was one of the first rack coating materials to receive fairly wide commercial acceptance. It was applied as a tape and then vulcanized or, in some cases, it was "plated" on the rack by anophoresis. Rubber coatings are tough and resilient and for this reason

have excellent resistance to mechanical damage. They deteriorate fairly rapidly in hot solutions and also in oxidizing solutions, this deterioration appearing initially as cracks and checks. These cracks and checks give rise to drag-out and drag-in problems. Decomposition products from rubber coatings have deleterious effects on many plating solutions, especially chromium plating solutions in which rubber increases the trivalent chromium content and otherwise contaminates them harmfully. These disadvantages of rubber have limited its use as a rack coating material.

## Hot-Dip Wax Coatings

Wax coatings, applied by dipping racks into the molten compound, were occasionally used in the late 1930's. The waxes were usually of the chlorinated type. They were easy to apply and possessed excellent resistance to plating and cleaning solutions. They were not entirely satisfactory, however, because they were deficient in flexibility and mechanical strength. The hot-dip wax coatings were easily damaged by rough handling. Although you hear little about these coatings today, a few platers continue to use them on occasion.

## Tapes

Almost every plater has used at some time a rack coating tape based on synthetic resins. They were very handy for quick, temporary insulation of simply designed racks. They can also be used as a stop-off in selective plating.

There are two common types of tape, both based on vinyl resins. One type has self-sticking adhesive applied to the back; the other has no adhesive. Those that contain no adhesive are applied in one of two ways: 1) The tape is wrapped around the rack and the ends secured with a special cement or 2) The tape is wrapped around the rack, ends are held with plastic cord or wire, and the entire coating is heat fused to produce a solid sheath.

These vinyl-base tapes have excellent resistance to

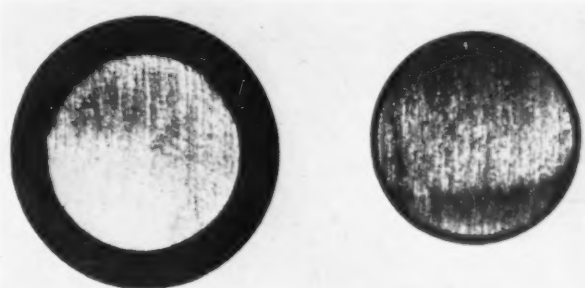


Figure 1.  $\frac{3}{4}$ " copper rod on left has a single coat of plastisol type insulation material over a primer coat. The same rod on the right has 8 coats of solvent-type insulation.

plating room chemicals. However, the adhesives used on some adhesive-back tapes are not highly resistant to strong oxidizing solutions. One of the great disadvantages of all tape rack coatings is the rough surface which results from overlapping of the tape as it is wound around the rack. This roughness increases drag-out losses and also increases the danger of solution contamination by drag-in. With all discontinuous coatings of this type, there is also danger of undercutting and eventual deposition of metal on the rack and further damage to the coating.

### **Synthetic Resin Solution Coatings**

Solutions of synthetic resins, usually of the vinyl type, were the most widely used rack coating materials from the middle 1930's until about 1943 when the resin dispersion coatings came into prominence.

There are two basic types of vinyl resin solution rack coating materials. They are an air-drying coating and a force-drying one which is set up at a temperature of 200° to 250°F. The air-drying coating does not possess great adhesion to the rack stock but shrinks around the rack while drying to form a tight-fitting film. The force-drying material, on the other hand, develops good adhesion to the rack metal at temperatures between 200° and 250° F.

Both the air-drying and the force-drying coatings have good chemical resistance and can provide long, trouble-free service. The force-drying materials are somewhat superior in resistance to undercutting especially around the rack contacts. Both types are superior to tapes in regard to smoothness.

The greatest disadvantage of these synthetic resin solutions is the thin coatings they produce. In order to obtain a film thick enough for ordinary use, it is usual-

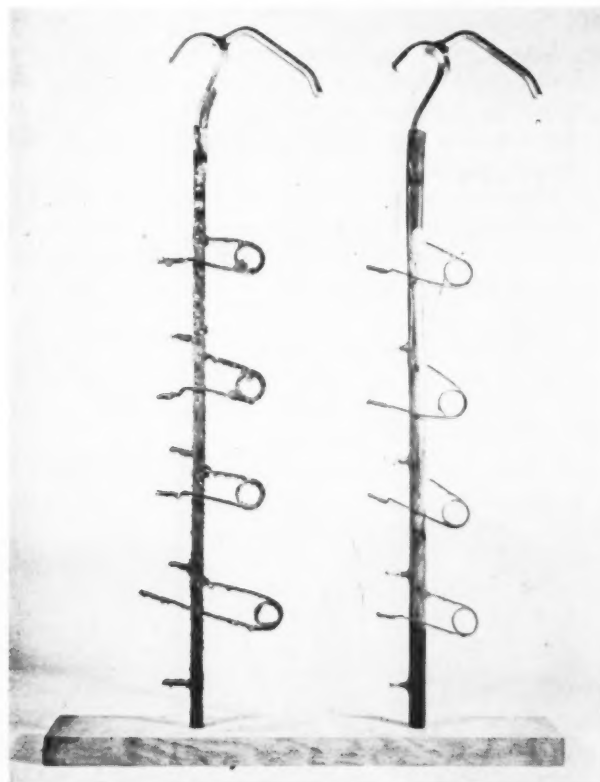
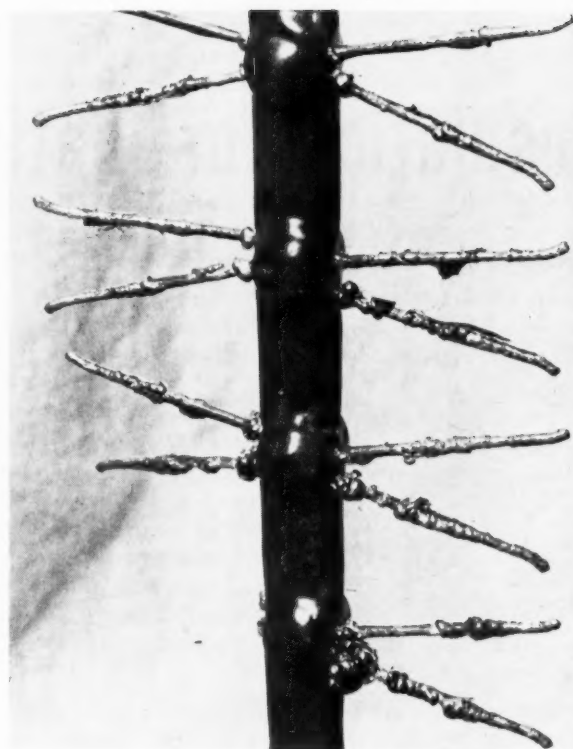


Figure 2. These two racks were used in an alkaline lead plating bath for a period of two weeks (left) and 8 months (right). Rack on left has 8 coats of solvent type insulation, rack on right 1 coat of plastisol type insulation.



(Courtesy Lee Silver Service - Detroit)

Figure 3. Failure of the coating on this rack has permitted the accumulation of nearly six dollars worth of gold on the exposed rack surfaces.

ly necessary to apply 4 to 8 coats, allowing up to one hour of air-drying between coats. Only thin films can be obtained from these materials because it is necessary to keep the resin content low. When attempts are made to increase the resin content, the material first passes into a thixotropic and then a gelled state unsuitable for coating purposes. Despite this limitation, resin solutions continue to be used by many platers.

### **Resin Dispersion Coatings**

The resin dispersion coatings are the newest and most advanced development in the rack coating field. They were first used commercially about 1947. Included in this group are plastisols, organosols, and hydrosols, of which the plastisols are by far the most commonly used. These materials are high solids dispersions of synthetic resins, again usually vinyl-type, in plasticizers, other organic liquids, or water. They are two-phase systems, one phase being the solid dispersed resin and the other the liquid.

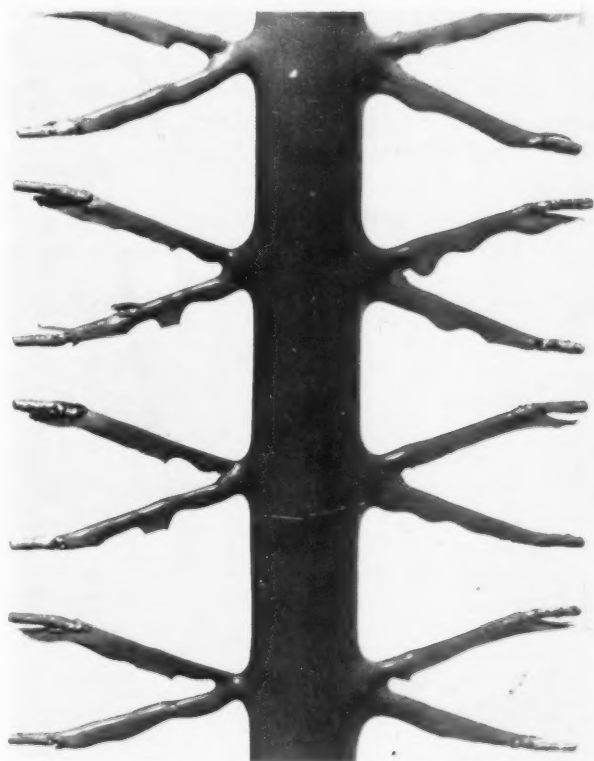
The essential difference between plastisol and organosol compositions lies in the type of liquid phase used. With plastisols the liquid phase consists of a plasticizer or blend of plasticizers which are organic liquids having very high boiling points or very low volatility. For all practical purposes, it can be considered that plastisol has 100% non-volatile content. An organosol, on the other hand, contains in the liquid phase both plasticizers and other organic liquids called solvents and/or diluents which have lower boiling points or high volatility. An organosol has less than 100% non-volatile content.

It is possible to control the viscosity of an organosol more accurately than a plastisol and under certain conditions or uses, an organosol might be desirable. However, for rack coating purposes where the con-



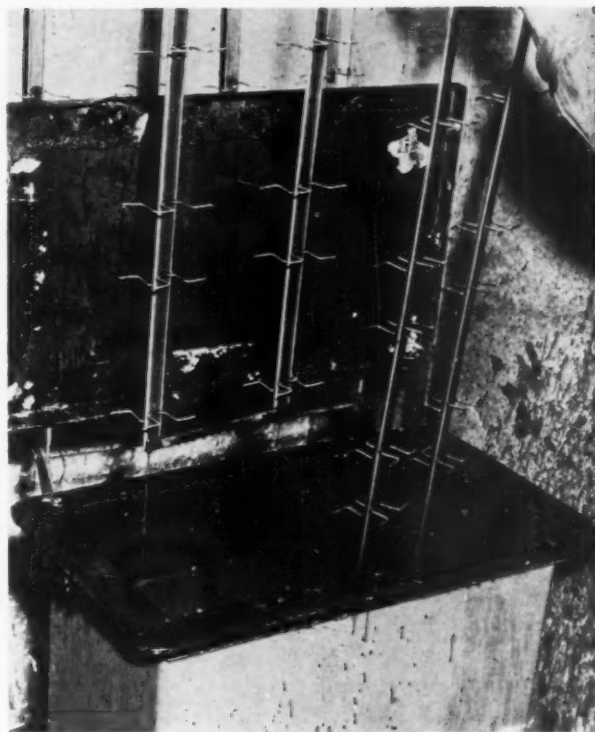
tainer holding the rack coating is usually left open, there is evaporation of the volatile constituents in the organosol which necessitates frequent adjustments of viscosity by additions of "thinner." Another disadvantage of the organosol is that when the volatile solvent evaporates, the dispersed resin tends to dry out on the sides of the containers and as the liquid level is lowered through use, these dried out particles may drop back into the body of the liquid causing lumps. Such a lumpy organosol has to be completely re-processed.

Liquid plastisols and organosols are transformed to a solid, rubberlike coating by essentially a physical mechanism. In the original or two-phase state, the plastisol or organosol is a dispersion of discrete resin particles in an organic liquid. At normal atmospheric temperatures, this liquid is either not a solvent or, as is more often the case, is only a weak solvent for the resin. In a properly formulated plastisol or organosol, the liquid has a slight solvating effect on the resin and such a condition leads to better packaged stability and less tendency towards settling out of the solid particles. In such a system each resin particle is slightly swollen around the periphery by the liquid medium. Since the liquid is a poor solvent, at room temperature, the inner core of the resin is not attacked. As the temperature of the dispersion is raised, the liquid phase becomes more and more of an active solvent thus penetrating deeper into the core of each resin particle until finally at a certain elevated temperature the resin is completely soluble in the liquid. Usually, such a condition is reached at a temperature of 350 to 375°F. Since the resin content is rather high, a gel rather than a free flowing liquid is formed when the resin is completely dissolved in the liquid. Upon cooling, this gel hardens to a rubber-like coating so familiar to platers.



(Courtesy Lee Silver Service)

Figure 4. This rack had same service as rack in Figure 3. Note the small amount of gold accumulation, which is confined to the tips of each contact arm.



(Courtesy F. D. Pace Co. - Grinnell Corporation)

Figure 5. Racks being removed from prime coating bath, prior to plastisol dipping operation.

One of the problems encountered with plastisols and organosols is lack of adhesion. This problem is overcome by the use of suitable primers. The better primers that are available today are so good that they provide a degree of adhesion unapproached by other types of rack coatings.

Plastisol and organosol coatings are usually applied in the following manner. First, the rack is primed and the primer baked. If a heavy coating is desired the rack is dipped into the plastisol or organosol while still hot from the primer baking operation. If a thinner coating is needed, the rack is allowed to cool before it is dipped in the plastisol or organosol. The rack is then removed from the dipping tank and the excess material allowed to drain. Then the rack is placed in the oven and the coating is baked. The final step is to trim the contacts.

Plastisol and organosol rack coatings are generally acknowledged to be the finest available today. They have the best chemical and physical resistance. These coatings alone are satisfactory for use in vapor degreasing cycles. They produce a very smooth, free rinsing coating that minimizes drag-out. In addition, the coatings are tough and resilient, possessing excellent resistance to mechanical damage. What is especially important during these times of high overhead costs, they produce thick coatings in a very short time.

In this section on resin dispersion coatings, we have not yet gone into any detail about the hydrosols. These are dispersions of latex in water. The hydrosol does not develop a continuous film when air-dried. It must be force-dried at temperatures up to 180° to 200° F. This force-drying may be done in a hot water bath.

The hydrosols have two disadvantages which have limited their acceptance. One is that the material is injured by storage at cold temperatures. In freezing weather, the dispersion is destroyed. Its other disadvantage is that it is most often necessary to add a

**Table 1 — Rack Coatings**

TYPE OF COATING	HOW APPLIED	NUMBER OF COATS	ADVANTAGES	DISADVANTAGES
RUBBER	Anophoresis or wrapping and Vulcanizing	1	Good resistance to some chemicals; Excellent abrasion resistance and toughness.	Break down in hot solutions and oxidizing solutions, resulting in contamination.
TAPES:				
Adhesive Back	Simple wrapping	1	Good chemical resistance; Very easy to apply to racks of simple design.	High drag-out; Adhesive breaks down in strong oxidizing solutions; Susceptible to undercutting.
Plain Back	Wrap and cement ends or bake	1	Excellent chemical resistance; Easy to apply to racks of simple design.	High drag-out; Susceptible to undercutting.
HOT DIP MATERIALS (Waxes)	Dip rack in molten wax and air-dry	1-3	Excellent chemical resistance; Easy to apply.	Coating is brittle and easily damaged by rough handling.
LACQUER-TYPE: Air-dry	Dip rack in material and air-dry	4-8	Excellent chemical resistance; Free rinsing; No special equipment required.	Application takes long time; Susceptible to undercutting.
Force-dry	Dip rack in material and force-dry at 200° to 250°F.	4-8	Excellent chemical resistance; Free-rinsing; Good adhesion.	Application takes long time; Force-drying required.
RESIN DISPERSIONS:				
Plastisols	Prime rack, dip in plastisol and bake at 300° to 350°F.	1	Excellent chemical resistance and adhesion; Free-rinsing; Tough and abrasion-resistant; Racks can be coated quickly.	Baking equipment required.
Organosol	Prime rack, dip in plastisol and bake at 300° to 350°F.	1	Excellent chemical resistance and adhesion; Free-rinsing; Tough and abrasion-resistant; Racks can be coated quickly.	Baking equipment required. Possibility of lumpy condition.

protective colloid to the dispersion. This protective colloid is usually water-soluble, lowering the resistance of the coating to water and plating solutions. Under these conditions, it is possible that plating solutions might become contaminated. In spite of these disadvantages, the potentialities of hydrosols are so promising that research is being carried on and there will probably be improvements in hydrosol coatings in the future.

### **Improving Rack Coating Technique Preparing Racks for Coating**

The best rack coating will not give completely satisfactory service unless it is properly applied to a well prepared rack. Preparation of the rack prior to coating is particularly important.

Whenever possible, racks should be constructed with round stock. If rectangular stock is used, it is advisable to round all sharp corners and edges. Unless this is done, a thin coating is produced on the sharp edge. Obviously a thin coating on a sharp edge is susceptible to mechanical damage which can result in premature failure of the coating. Avoidance of sharp edges is imperative when racks are to be coated with tape or resin solutions, which produce relatively thin coatings to begin with.

In order to obtain a satisfactory coating, all crevices or cavities around joints which might trap air when the rack is dipped in the coating material should be filled with solder. When baking or force-drying-type coatings are to be used, care must be taken to use a solder with a high enough melting point to avoid softening during the baking or force-drying operation. If crevices are not filled, the coating will frequently bridge over them, trapping air to form "blisters." "Blisters" that break create pockets that drag out solutions and increase danger of solution contamination.

Racks should be cleaned thoroughly to assure satisfactory adhesion of the rack coating. The best method is sandblasting, since it cleans as well as roughens the surface. If sandblasting is not practicable, the following procedure may be used. Remove electrodeposits from the racks by mechanical means, such as wire or



(Courtesy F. D. Pace Co.)

Figure 6. Coating racks in plastisol type material. Note heavy film running off the rack spline, as well as absence of webbing.



(Courtesy F. D. Pace Co.)

Figure 7. Coated racks entering the curing oven after preliminary dryoff period.

scratch brushing, or by chemical or electrochemical stripping. Then clean the rack in an alkaline cleaner or a degreaser, rinse and dry. After degreasing, it is advisable but not absolutely necessary to follow with a dip in a sulfuric-nitric acid bright dip, rinse and dry.

Undercutting around contacts has long been a problem. It can be minimized by applying solder to the contacts, and then cleaning, bright dipping, rinsing and drying as described above.

### **Applying the Coatings**

General instructions for applying proprietary rack coatings vary so greatly that they cannot be gone into in detail. The following contains a few general suggestions that are applicable to coating operations with most proprietary rack coatings.

Any liquid rack coating of relatively high viscosity which is applied by dipping can entrap air. Air bubbles are to be avoided since they can produce inferior coatings by causing "blisters."

The resin solution coatings are not so susceptible to air entrapment as the plastisols and organosols. Nevertheless precautions must be taken. It is important to maintain the viscosity of the material in accordance with manufacturers' recommendations. Most manufacturers' instructions contain information about determining viscosity with an efflux viscosimeter such as a Zahn or Ford Cup. When the viscosity rises, as a result of solvent evaporation, it should be adjusted to the correct value by adding the proper solvent. Prevention of increases in viscosity minimizes air entrapment.

Rapid plunging of a rack into a resin solution coating or turbulent agitation of a rack in the coating material will entrap air. As they accumulate, air bubbles rise to the surface of the coating material in the dipping tank, producing a froth. This froth can best be eliminated by covering the tank and allowing it to remain idle for ten to fifteen minutes. In some instances, this procedure fails to eliminate the froth. If such a situation arises, it is advisable to try to scrape the froth from the surface.

When resin solution coatings are used, webs occasionally are formed between parts of the rack as it is withdrawn from the coating material. These webs thin



out like soap bubbles and finally break with a snap, producing innumerable small air bubbles in the coating. If the withdrawal of the rack is stopped for a few seconds when webs first appear at the solution level, they will break while they are small and thick so that no air bubbles are formed.

Air bubbles in plastisol and organosol materials are also produced by rapid plunging of racks into the coatings or by excessive agitation of the racks while immersed. Because plastisols and organosols are so viscous, air bubbles rise through them very slowly. When considerable air has been introduced into them, it is advisable to allow the tank to remain idle until the bubbles rise to the surface. Those bubbles that do not burst by themselves can be punctured with a pointed stick or other sharp implement.

It is essential that additions of plastisol or organosol to dipping tanks be made carefully. The lip of the container from which the material is being added should be held no more than a few inches from the surface of the material in the dipping tank. Then the addition should be poured very slowly. Careless dumping of additions entraps large, difficult-to-remove volumes of air.

The variations in viscosity of the better plastisol materials, even after long use, are insignificant. Only under the most rare circumstances does viscosity vary sufficiently to impair the material. Organosols, on the other hand, containing varying amounts of volatile liquid, are subject to viscosity change. Manufacturers instructions usually explain how to maintain the viscosity at the correct level.

Baring contacts after racks have been coated with materials having good adhesion can be a difficult and time-consuming operation. It can be simplified by making masks which are applied to the tips before the rack is coated. These masks can be made of any handy material, such as cork or wood. In some plants, plastisol masks are used. They are made to fit tightly around the contact, thus preventing the coating material from creeping through the opening to produce a film on the contact. After the rack has been coated it is only necessary to cut through the coating that has overlapped the mask and remove the mask.

When plastisol and organosol coatings are used, the thickness of the coating is a function of the heat capacity of the rack metal. Sometimes it is difficult to obtain the desired thickness on a thin contact arm. Some plants overcome this problem by priming the entire rack and then slipping a suitable length of vinyl tubing of the proper inside diameter over the primed contact arm. The plastisol or organosol coating is then applied in the ordinary manner. This vinyl tubing is available in a variety of diameters that will accommodate most racks.

### **Patching**

Many plating plants are lax in regard to rack maintenance. If racks are removed from production at the first sign of damage to the rack or its protective coating, considerable time and expense can be conserved. Resin solution coatings as well as plastisols or organosols can be effectively and economically patched in short order. Tape coatings can also be patched easily,

but it is usually advisable to re-wrap the entire rack if the coating has been in service for any length of time.

Most resin solution coatings can be patched with the original coating material. In preparing the rack for patching, all loose coating should be cleanly cut away. Electrodeposits on the bare rack metal should be removed. Before the patch is applied the rack should be thoroughly rinsed to remove plating salts which may have dried on the bare metal. The proper number of coats of patching material can then be applied. Most often the patch can be applied with a brush.

Many manufacturers of plastisol and organosol materials supply patching compounds. Some are vinyl-base materials with a putty-like consistency that require baking. Others are heavy-bodied, air-drying materials. Both are good materials which can be depended on to provide long, trouble-free service.

Leading manufacturers in the rack coating field maintain service departments which can be called upon for assistance. The men in these departments are specialists who can demonstrate the most efficient techniques for applying and patching rack coatings. The assistance that can be obtained from these specialists will materially assist platers to reduce their costs, conserve materials, and improve the quality of their plating.

## **NUTMEG CHROME CORP.**

*(Concluded from page 58)*

Nutmeg Chrome Corp. is called upon for a wide variety of highly special plating jobs. In the past they have worked on parts for giant cyclotrons, atomic bomb tools, special overhaul jobs in jet and aircraft engines, and cutaway displays of aircraft engines and parts for show purposes. It was one of the plants specially selected for a visit by the E.C.A. team of British electroplating experts in 1950. Art was the recipient of a special award for mold plating work.

Art uses a standard 53 oz./gallon chromic acid bath for all his work, both hard and decorative. His preference is based on the better throwing power and insensitivity to minor changes in composition of the bath. Other than this, he says there are no secrets, but a lot of tricks, to successful hard chrome plating. He has tried many of the new chrome processes, but has not found enough advantage in any one of them to warrant changing from his familiar bath mentioned above. "When a really better process comes along," he says, "we will be the first to use it, you can be sure." He is firmly of the opinion that 90% of hard chrome problems require ingenuity and mechanical "horse-sense," rather than special or tricky baths.

With all this activity, Art still manages to devote a full measure of time to his wife and family of five children. He was never more proud than when his son's Little League Alumni baseball team won the Connecticut Championship this year. He considers that his unofficial Little League coaching job helps him with his official job of coaching (from the field) the East All-Stars in the annual A.E.S. convention contest. From all appearances his success along these lines parallels his success as a bread-winner and businessman.

# Determination of Sulfate in Chromium Baths Using Radiobarium<sup>(1)</sup>

By Stanley L. Eisler, Chemist, Ordnance Corps, Rock Island Arsenal, Rock Island, Ill.



Mr. Eisler is at present chemist in charge of radioactive isotope work of the Rock Island Arsenal Laboratory. He received his A.B. degree from Indiana University in 1933. Between 1944 and 1946 he was associated with Carbide and Carbon Chemicals Corp., operators of the gaseous diffusion plant at Oak Ridge as Supervisor of the Mass Spectrometer Laboratory.

A procedure employing radiobarium in the precipitating agent used for determining sulfate concentration is described. The sulfate concentration was found to be inversely proportional to the counting rate of the filtrate containing the excess radiobarium. Test results compared with those of the conventional gravimetric procedure, using a known sulfate concentration, indicated better results could be obtained by using the radiometric method.—Ed.

THE accuracy of the sulfate ion determination in chromium bath plating solutions is very important because of the very low concentration of sulfate ion in the bath and the necessity of maintaining as near as possible a definite ratio of chromium trioxide to sulfate ion. The ratio must be maintained to insure maximum plating efficiency and a smooth chromium deposit.

The presently-used gravimetric method, which determines the sulfate ion as precipitated barium sulfate, has proven unreliable because of co-precipitation of other anions and cations and the possibility of dirt or other impurities being collected in the precipitate. According to Karaglanov<sup>1</sup> the amounts of different ions contaminating the precipitate are related to the solubility of the corresponding sulfate in the case of cations and the solubility of the corresponding barium salt in the case of anions.

He also claims that this cannot be explained on the basis of absorption, but on the assumption that with the formation of barium sulfate, a secondary chemical precipitation process takes place in which the cations and anions in question participate. In another article<sup>2</sup> Karaglanov claims that many procedures give good results as a result of compensation of errors and he theorizes that products such as  $(\text{BaCl})_2\text{SO}_4$  are formed and affect the determination proportionately to their insolubility.

(1) The opinions or assertions contained herein are not to be construed as official or reflecting the views of the Department of the Army.

This investigation was inaugurated to eliminate the shortcomings noted above and to reduce the time required for the analysis, if possible. The basic plan involved the use of radiobarium as barium chloride in a solution of normal barium chloride as the precipitating agent, and then it was planned to make counts of the excess radiobarium contained in the filtrate after filtering out the precipitated barium sulfate. It was assumed that this counting rate would be proportional to the excess amount of barium not used for the precipitation and inversely proportional to the amount used and to the amount of sulfate ion in the original sample.

## Preliminary Experiments

The radiobarium used for this investigation was purchased from the Oak Ridge National Laboratory by authorization of the Atomic Energy Commission, Isotopes Division. The radiobarium was purchased as a mixture of Barium 140 and its daughter Lanthanum 140 in a HCl acid solution. The radiobarium was added to the 10%  $\text{BaCl}_2$  precipitating solution to give an activity level of 0.5 microcurie per milliliter.

In the gravimetric method, previously mentioned, the sulfate is precipitated as barium sulfate by adding 15 ml. of 10%  $\text{BaCl}_2$  solution, filtered out, ashed and weighed. The procedure used for the radiobarium tests followed this procedure up to the point of filtration with the exception that the barium chloride solution contained the radiobarium as a tracer.

When the first tests using counting techniques were conducted, it was found that the amount of barium chloride used was in great excess. As a result, the slight differences in the amounts used for precipitation of slightly different sulfate concentrations were not detectable by counting, due to the statistical variations exceeding these small variations. The stoichiometric amount of  $\text{BaCl}_2$  required to precipitate 10 ml. of N/10  $\text{H}_2\text{SO}_4$ , the largest amount employed in these tests, was calculated to be 1.04 ml of 10%  $\text{BaCl}_2$  solution. Therefore, it was decided to standardize on the use of 2 ml of precipitant which would provide a sufficient excess of  $\text{BaCl}_2$  over the stoichiometric amount required.

The procedure followed after the filtration operation was to make up the filtrate to 200 ml, pipette a 1 ml. aliquot into a stainless steel cup, dry under an infra-red lamp and then count.

The results of a preliminary test using only varying amounts of N/10  $\text{H}_2\text{SO}_4$  without the usually present  $\text{CrO}_3$  are presented in Table 1. It will be noted that the results plotted would very nearly follow a straight line curve.

**Table 1**  
**Effect of Sulfuric Acid Concentration**  
**on Counting Results**

ml of N/10 H <sub>2</sub> SO <sub>4</sub>	Counting Rate Counts/min.
10	1905
8	2353
6	2952
4	3393
2	3716
0	4202

#### Standard Curve Method

A series of experiments similar to the one previously described were carried out using the varying amounts of N/10 H<sub>2</sub>SO<sub>4</sub> and 10 ml of 25% CrO<sub>3</sub> solution in each sample. The results of a typical experiment are presented in Table 2. It will be noted that the results would follow a straight line curve as in the previous experiment.

Several standard samples as well as unknown samples were run in duplicate to determine the degree of reproductibility. The results indicated a degree of reproductibility with a 1 to 2% deviation from the mean. Considering the randomness of atomic disintegration and other factors, this degree of reproductibility is very good.

The linearity and the reproducibility of the method having been proven, it was planned to run the unknown samples, determine the counting rate, and from the chart determine the corresponding sulfate concentration. This method was found to work effectively when both unknown samples as well as standards from which the chart was prepared were run simultaneously. However, when unknown samples only were run and counted at a later date, with corrections for decay on the basis of the half-life of Ba<sup>140</sup>, the results fell out of line. The reason that samples of this type cannot be corrected for decay is that the transient equilibrium which exists between Ba<sup>140</sup> and La<sup>140</sup> prior to the precipitation is upset by a removal of a portion of the radiobarium. Thereafter, and until such time as transient equilibrium is again restored, the decay curve of the mixture will be displaced towards that of La<sup>140</sup> and away from that of Ba<sup>140</sup>. Therefore, it would be necessary to let samples stand for several days before counting in order to allow time for the transient equilibrium to be restored. This is, of course, not practical

**Table 2**  
**Effect of Sulfuric Acid Concentration**  
**on Counting Results**

(All samples contained 10 ml of 25% CrO<sub>3</sub> Solution)

ml of N/10 H <sub>2</sub> SO <sub>4</sub>	Counting Rates Counts/min.			
	1st	2nd	3rd	Ave.
7	1732	1772	1742	1749
6	1839	1832	1858	1843
5	1962	1976	1946	1961
4	2012	2064	2064	2047
3	2135	2170	2141	2149

when the analyses are being made for a production shop. Therefore, another method which would not require decay corrections was deemed advisable and efforts were directed in that direction.

#### Percentage Decrease Method

It was reasoned that, if the percentage decrease in counting rate per ml. of N/10 H<sub>2</sub>SO<sub>4</sub> from a blank containing no H<sub>2</sub>SO<sub>4</sub> was a constant, that this value could be used. It would then only be necessary to run the blank with each set of samples or perhaps only once for each batch of radioactive BaCl<sub>2</sub> prepared, as the transient equilibrium would not be upset in the case of the blank. Therefore, decay corrections could be made for the blank by using the decay rate of Ba<sup>140</sup>, which the mixture follows when in transient equilibrium.

A series of tests was conducted using various activity levels in the BaCl<sub>2</sub> solution and samples containing 4, 5 and 6 ml of N/10 H<sub>2</sub>SO<sub>4</sub> with the customary 10 ml of 25% CrO<sub>3</sub> solution. The CrO<sub>3</sub> solution corresponds to the concentration found in the chromium plating tanks and was included to simulate actual tank samples. The range of from 4 to 6 ml of N/10 H<sub>2</sub>SO<sub>4</sub> was selected as being well beyond the extremes that might be encountered in the sulfate concentration of the plating baths.

The results of these tests are given in Table 3. Using the average result of these tests, a factor was calculated to be used to determine the oz./gal. of sulfate ion in the tank sample. This factor was derived as follows:

$$\begin{aligned} & \frac{1}{[(CR_B - CR_U) \div CR_B] \times \frac{1}{.0235}} = \\ & \text{ml of N/10 H}_2\text{SO}_4 \\ & \text{since ml of (N/10 H}_2\text{SO}_4 \times 4.9) \div 10 = \\ & \text{mg/H}_2\text{SO}_4 \text{ per ml of sample} \\ & \text{and mg/ml H}_2\text{SO}_4 \times .132 = \text{oz./gal. H}_2\text{SO}_4 \\ & \text{and oz./gal. H}_2\text{SO}_4 \times .98 = \text{oz./gal. SO}_4^{--} \\ & \therefore [(CR_B - CR_U) \div CR_B] \times \frac{1}{.0235} \times .49 \times 1.32 \\ & \times .98 = \text{oz./gal. SO}_4^{--} \\ & \text{or} \\ & [(CR_B - CR_U) \div CR_B] \times 2.698 = \text{oz./gal. SO}_4^{--} \text{ (A)} \\ & \text{where } CR_B = \text{average net counting rate of blank} \\ & CR_U = \text{average net counting rate of unknown} \end{aligned}$$

#### Comparison of Methods

The establishment of the percentage decrease method as the method of choice led to the question as to how the results obtained by this method would compare with those of the conventional gravimetric procedure. It was not expected that good agreement would be found due to the shortcomings of the gravimetric procedure previously discussed. However, it was desired to learn if results obtained by the new method would at least fall within the expected range.

A number of tests were conducted to determine the sulfate content radiometrically and comparisons were made with the gravimetric results of the same samples. The results of these comparative tests are presented in



**Table 3**  
**Percentage Decrease Method**

Test No.	ml N/10 H <sub>2</sub> SO <sub>4</sub>	Average Counting Rate Counts/min.	% Decrease from blank per ml N/10 H <sub>2</sub> SO <sub>4</sub>
G-5	0	1625	
	4	1471	2.37
	5	1417	2.56
	6	1392	2.39
G-6	0	2894	
	4	2636	2.23
	5	2568	2.25
	6	2486	2.35
G-7	0	2001	
	4	1806	2.44
	5	1792	2.09
	6	1683	2.65
H-1	0	2556	
	4	2317	2.34
	5	2241	2.46
	6	2191	2.38
		Average =	2.35

Table 4. It will be noted from these results that there are several large differences between the two values for the same sample. However, in other cases there is quite good agreement. There are any number of reasons which may be advanced for the discrepancies, some involving the gravimetric procedure and some the radiometric procedure. The reasons involving the gravimetric procedure have been previously discussed. The main reason for discrepancies in the radiometric procedure is that the method does not effect complete precipitation. This is due to the amount of excess barium chloride being held to a minimum in order to be able to detect more accurately the small differences in counting rates, as was previously mentioned. Since complete precipitation of the sulfate is not attained, it is necessary that the procedure be carried out with all steps timed for definite periods. This is particularly true for the precipitation period and the time the filtrate stands before the aliquots are withdrawn.

Several tests were conducted using the final approved test procedure, to be described subsequently, which provides for definite times for each step as mentioned in the preceding paragraph. The results of these tests are tabulated in Table 5. It will be noted that the wide discrepancies between the two methods have been eliminated with the exception of the results for Tank 9. This seems to indicate that use of the standard procedure will correct the previously noted wide discrepancies. Small differences are to be expected due to experimental errors in one method or the other.

It is realized that this method employing only partial precipitation is based on relative values determined using standard solutions. However, due to the small range of values encountered in the analysis of sulfate in the chromium plating baths, it is believed that the use of a relative determination will prove sufficiently accurate.

**Table 4**  
**Comparison of Radiometric and Gravimetric Methods**

Test No.	Tank No.	Sulphate oz./gal.	
		Gravimetric Method	Radiometric Method
G-8	4	.374	.393
	5	.353	.348
	6	.326	.238
	Small	.400	.332
	Large	.357	.304
G-9	7	.308	.275
	8	.349	.332
	9	.356	.313
	10	.328	.265
	15	.373	.353
G-8-b	4	.357	.286
	5	.332	.314
	6	.342	.282
	Small	.384	.421
	Large	.366	.329

**Table 5**  
**Comparison of Final Approved Radiometric Method and Gravimetric Method**

Test No.	Tank No.	Sulfate oz./gal.	
		Gravimetric Method	Radiometric Method
H-6	4	.333	.370
	5	.341	.324
	6	.348	.372
	Small	.337	.318
	Large	.368	.362
H-7	8	.350	.353
	9	.333	.285
	10	.346	.341

One of the possible sources of error was believed to be the varying percentages of trivalent chromium contained in the different tanks from which samples were withdrawn. The concentration of trivalent chromium increases in the tank during use due to reduction of the hexavalent chromium by hydrogen formed at the cathode. The effect of higher trivalent chromium concentrations was believed to cause high results in the gravimetric method due to difficulty in washing the last traces from the precipitate.

An experiment was conducted to compare the gravimetric method with the radiometric method using a 25% solution of CrO<sub>3</sub>. One solution contained no trivalent chromium while the other contained 2.3% trivalent chromium. To these two solutions there was added equal amounts of sulphuric acid to bring the sulfate ion concentration up to .317 oz./gal. The results obtained were as follows:

Solution	Gravimetric	Radiometric
0% Cr <sup>+++</sup>	.356	.304
2 to 3% Cr <sup>+++</sup>	.361	.328
Average	.358	.316

From these results it may be seen that the presence of trivalent chromium did not affect the gravimetric results as was expected. However, it is significant to note that the radiometric results are much closer to the true value of sulfate which was added to the solutions. This would indicate that the radiometric method is the more reliable of the two methods.

#### Final Approved Test Procedure

The results obtained using the final approved test procedure proved superior, so the procedure recommended is as follows:

1. Pipette 10 ml of sample into a 400 ml beaker.
2. Add 100 ml of water, 10 ml of concentrated hydrochloric acid, 15 ml of glacial acetic acid and 20 ml of ethyl alcohol.
3. Boil for 20 minutes.
4. Add 25 ml of 1% gelatine solution and bring to a boil.
5. Add dropwise while stirring 2 ml of 10%  $\text{BaCl}_2$  solution containing approximately 0.5 microcurie of radioactive  $\text{BaCl}_2$  per ml.
6. Boil for one minute and then allow to stand in a warm place for one hour.
7. Filter and wash with hot water collecting the filtrate and washings in a 200 ml volumetric flask.
8. Make up the filtrate to 200 ml, shake thoroughly and allow to stand for one hour.
9. Carefully pipette, without shaking the flask, a 1 ml aliquot into a stainless steel counting cup. Prepare counting samples in duplicate.
10. Dry the samples in the cups under an infra-red lamp.
11. When cool, count the samples for 5 minutes each. Make at least two determinations on each cup.

Calculate the sulfate concentration using the formula A. above.

#### Counting Procedure

All counting was done by centering the counting cup on an aluminum plate placed on the first shelf of a Lucite mount, so that the bottom of the cup was ten millimeters from the mica window of the counter tube. The entire assembly was mounted in a vertical lead shield with  $1\frac{1}{2}$  inches of lead shielding. The counter tube used was a Tracerlab TGC-2 tube with a mica window thickness of 1.7 mg./cm.<sup>2</sup> The tube was operated at a constant voltage of 1350 volts supplied by a Nuclear Instrument and Chemical Corp. Count-O-Matic Scaling Unit, Model 163.

#### Summary

The use of this method may possibly eliminate the co-precipitation of other anions and cations, if the statement of Karaglanov is true that these precipitating reactions occur after the precipitation of barium sulfate, due to the fact that only partial precipitation is achieved. This would seem to indicate that a definite advantage may be gained by using the radiometric procedure.

The author wishes to express his appreciation to his co-workers at the Rock Island Arsenal Laboratory for their assistance and to the Ordnance Corps, Research and Development Div. of the Department of the Army

and supervisory staff of the Laboratory for permission to publish the information in this paper.

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#### DRAGOUT CONTROL

(Concluded from page 64)

1 — .016 or .984. If this trick were not used, the recovered fraction would amount to only .32 for three tanks.

Another variation of the same strategem is to use one or more hot "dragin" tanks as shown in Figure XV, provided of course, that a low concentration of plating solution can be permitted to come into contact with the work prior to its entry into the plating bath itself.

An additional aid wherever it can be practiced is to put the work into the plating tank dry, or with a minimum of moisture on it.<sup>16</sup> If the dragout rate is close to the evaporation rate this has the automatic effect of doubling the evaporation rate without the application of heat, etc. and it is therefore a valuable adjunct, if it can be used.

#### Other Dragout Recovery Systems

A combination equilibrium and non-equilibrium recovery method has been recently proposed for gold plating operations in which a compression still is used and part of the dragout solution is recycled to the plating tank with the balance concentrated, by use as feedwater to the still.<sup>17</sup>

#### Summary

It has been shown that by careful attention to details at the plating tank and by proper engineering of a recovery system, it is possible to reclaim practically all of the plating salts dragged out of the plating tank by the passage of work. Recovery of this material means increased profits to the plater, and the virtually complete elimination of the waste nuisance from this source.

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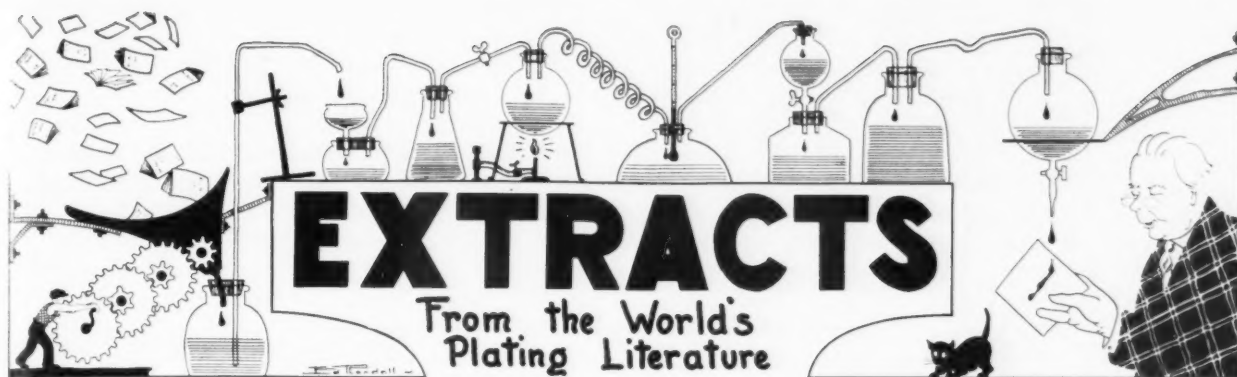
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#### CORRECTION FOR PART I DRAGOUT CONTROL

Equation 5 should have read  $f = \left( \frac{s}{-dg} \right)^{1/2} x^{3/2} F(x)$

Equation 6 should have read "where  $x \geq 1.1$ ."

Equation 7 should have read "where  $x \geq 1.1$ ."



### Causes and Remedies for Faults in Electroplating

H. W. Dettner; *Metalloberflaeche*, vol. 3, No. 7, pp. B97-B100.

Quite often in electroplating practice striking differences are encountered as regards corrosion resistance behavior between electroplated parts which have been processed by a mass production series flow procedure and those which have been plated individually such as for example in building-up work. One of the reasons for this consists in the fact that for mass flow production work the same type of component is being handled over and over again and that all the working conditions such as pretreatment, current conditions, time in the plating bath etc. can all be worked out and strictly adhered to. This serves to keep the scrap figure low and to ensure uniform plating. When processing individually on the smaller scale by the jobbing plater, failures can also be avoided if sufficient technical supervision is applied to the plating details. The most serious drawback on the jobbing plating scale of operations is that the corrosion resistance of the plated coating leaves something to be desired as compared with a large scale plated component, in most cases. The reasons for this in the majority of cases with the jobbing plater is insufficient thickness of plate, particularly with nickel plating and the sub-coppering. In the case of bright decorative chrome plating, because of the necessity to avoid matt plating, the extreme thinness of the chromium plate amounting to about 0.0003 mm. to 0.0005 mm. can hardly be expected to have any corrosion protective effect.

A nickel plated coating which would have a resistance to corrosion of at least a year under normal conditions, inclusive of any intermediate copper plate that may be applied, should have a thickness of at least 0.001 in. (0.025 mm.). In the automobile industry for certain parts thicknesses of 2 to 3 times this amount are applied. European practice is in general, to use smaller thicknesses than this, and a direct comparison between German and American plating practice in this direction is instanced.

The new German plating Standard Specification for November 1950 requires for the quality classification CrNi 30/FE, i.e. a 0.030 mm. thick chrome plated nickel on steel, a resistance of 96 hours in the salt spray test equipment, after which for each sq. dm. there should be no more than one rust pore and no rust pore should be more than 1 sq. mm. in size.

Nickel coatings on copper and copper alloys should on the important places amount to at least 0.008 mm. in

thickness while in the case of the nickel plating of zinc and zinc alloys the coating thickness should be at least 0.015 mm. and for more severe demands, 0.025 mm. in thickness. In this connection here, the Specification requires a stability resistance in the salt spray test of 72 and 144 hours respectively. Zinc and cadmium coatings on steel for moderate exposure should have a coating thickness of 0.004 mm. and for higher exposure requirements, thickness of 0.012, 0.025 and 0.050 mm. in thickness.

For nickel coatings on steel or zinc, the inner parts can be completely or partly replaced by copper. The chromium coating in the case of the nickel plating of steel, copper, zinc and their alloys should be at least 0.0003 mm. thick. The necessary time to attain this coating thickness is dependent on the current density applied and the current efficiency. In the case of nickel plating the latter amounts to about 90-98%. If the necessary current density cannot be applied as for example in the case of older nickel ammonium sulfate baths then about twice as long will be required for the nickel plate. On the other hand if an intermediate copper coating is being given, or a modern rapid plating bath is being used, then the plating time in the bath may be considerably reduced. As to whether an under-copper plate with the same total plated thickness has a greater or a reduced corrosion protective effect cannot be clearly answered at the moment. While maintaining the correct nickel plating period, in addition it must be considered that with matt baths the nickel may suffer a loss of 15 to 20%, particularly at the edges.

In the smaller plating works, more reliance is placed on the voltmeter for bath supervision than should be. The amount of metal deposited is dependent on the Faraday law, on the current density and on the time in the bath. The bath voltage will depend on the distance apart of the electrodes and other varying circumstances such as bath concentration, composition and temperature. Thus for the same voltage reading it is possible in some cases to deposit more and in other cases less metal, with constant current density and time.

However current control by means of the ammeter can also lead to plating faults. Thus, incorrect estimation of the metal area may lead to an incorrect current density being employed. Although the experienced plater often measures the area of the plated ware visually by rule of thumb, for important ware or series processing, this should always be done by accurate measurement.

The author then discusses other sources of failure



such as incorrect pH maintenance. The simple remedy here is to use pH indicator paper. Dirt in the bath is another prolific source of faulty plating. Adequate bath filtration should be provided and the buffing and polishing stages should be removed from proximity to the plating baths.

After discussing in detail faults liable to arise from incorrect degreasing and cleaning practice, mention is then made of pitting troubles. Pores may arise mainly from two causes — these being respectively due either to adherent hydrogen bubbles or to faults in the base metal such as grinding down cracks, scratches, surface pores in the case of cast iron as well as inclusions in the base metal. Suspended matter in the bath can also give rise to trouble — this originating from anode slime and often from residual polishing and cleaning materials adhering to the base metal surface from the cleaning stage and passing into the bath. Means to combat porous deposits and pitting proposed are variously according to circumstances the use of oxidizing agents, wetting agents, a lower pH bath value, a high bath temperature and movement of the wares in the bath. Bad surface condition of the base metal can be rectified by better grinding followed by a thicker copper deposit from the acid bath.

Porous deposits are a fruitful cause of a bad corrosion resistance behavior of the plate and a method is given by which porosity can be easily determined in a simple manner in the smaller plating works. A piece of white porous paper, if possible filter paper, is moistened with a 0.2% potassium ferricyanide solution and this is laid on the plated component to be tested. Large pores show up on iron after a few minutes by blue points and smaller pores within half an hour. If the base metal or intermediate plate is copper or brass, then brown points show up on the paper.

Finally a fault encountered in small plating works handling nickel, is discoloration of the ware in the bath. If dark streaks occur, foreign metals must be suspected in the bath, particularly zinc. The remedy is to heat the bath with soda, filter and then acidify afresh. Dark discoloration of the nickel in some circumstances may also indicate copper in the bath. To remove this a large, clean iron sheet is plated for several hours at a low current density. Acidifying and heating favors the copper separation. If the nickel deposit from the bath is yellowish, then too high a pH value may be suspected.

#### **Protal Aluminum Treatment Process for Corrosion Protection**

L. Andes; *La Chimie des Peintures*, vol. 14, No. 9, pp. 357-358.

This protective process which was first used in the aero industry is now used quite extensively in various manufacturing phases of aluminum fabrication for providing protection against corrosion of aluminum and its alloys and a keying surface for paint.

The Protal process is an exclusively chemical process for treating the light alloys. Its action is based on the three essential properties of aluminum:

1. Aluminum has an electromagnetic potential ( $-1.7$  volts at  $25^{\circ}\text{C.}$ ) which is higher than titanium cations ( $-0.37$  volts) and chromium ( $-0.40$  volts) and the fluorine anion ( $+2.85$  volts) and this fact

gives aluminum the capacity of displacing them from their aqueous solutions.

2. Aluminum has a great affinity for oxygen since the heat displaced disengaged by a gram-atom of oxygen with aluminum is 126,000 calories. Thus the metal is one of the most powerful reducing agents.

3. Finally, the low atomic volume (10.2) of aluminum and its electronic structure explain the property which it has of forming bonds of covalence and coordination which gives it the possibility of entering into very stable complex salts.

The Protal bath is an aqueous solution of salts comprising provisionally the fluorine anion and among other cations, chromium and titanium which the aluminum displaces to give rise to a complex insoluble fluoride of aluminum, of chromium and of titanium at its maximum oxidation. This compound is formed at the expense of the metal and the complex keys on to it to constitute a coating of very high adherence although of slight thickness.

This coating which is accordingly not a simple surface deposit is slightly porous and very absorbent; it constitutes an excellent keying base for applied paint films. The Protal coating only occasions a negligible increase in weight on the pieces treated.

In addition, a very interesting technical advantage of the Protal process is its ease of application. The treatment merely comprises very simple operations: degreasing, rinsing, and the chemical transformation as the actual part of the treatment. All these operations only require an elementary material which differentiates Protalization from the electrolytic decorative processes for aluminum. It should be emphasized that this treatment can be affected either by dipping or else by spray processing and it is never necessary to use plant material in stainless steel. Both the vat containing the solution, as well as the pipelines, racks, etc., if spray processing is employed, are of ordinary steel construction. The Protal bath is made up by dissolving in water a mixture of salts in the proportion of 110 grms. of salts per litre of water.

The characteristics of the coating obtained vary according to the temperature ( $15^{\circ}$  to  $45^{\circ}\text{C.}$ ) and the duration of the treatment (2 to 5 minutes by spray jet and 10 to 20 minutes by dipping). The optimum time and temperature are fixed in advance in such a manner as to obtain a surface possessing the characteristics exactly appropriate to the service objective it is desired to achieve: these objectives according to the particular application of the processed material are variously protection against corrosion, keying for an applied organic film, decoration.

Finally it may be added that the Protal treatment can be applied to assemblies of mixed metals of the light alloys and metals such as nickel, chromium and cadmium since the bath is without action on these metals. It can be noted in addition that as the processing is of a purely chemical nature, its action extends even to the difficult accessible areas such as for example the interiors of tubes of considerable length and of small diameter. It can feasibly be anticipated that the Protal process will become increasingly technically important as a processing procedure in the aluminum and light alloys fabricating industries by virtue of the facts given above.

## Shop Problems

METAL FINISHING publishes, each month, a portion of the inquiries answered as a service to subscribers. If any reader disagrees with the answers or knows of better or more information on the problem discussed, the information will be gratefully received and the sender's name will be kept confidential, if desired.

### Acid-Proof Metal

**Question:** We are in need of a metal container for mixtures of strong Nitric-Hydrochloric acid mixtures, and wonder if you can suggest something that can be used. We are familiar with the many ceramic and non-metallic materials that can be used, but for this special job a metal container must be used.

F. T.

**Answer:** Aqua-regia mixtures (nitric-hydrochloric) are particularly difficult materials for metals to resist. However, one of the newer metals commercially available, tantalum, resists this mixture very well. We are forwarding the name of a firm who can advise you on the possibilities for tantalum on your particular job.

### Bright Dip for Silver

**Question:** We would like to know if there is any bright dip that can be used for providing a bright, lustrous surface on silver plated ware and Sterling Silver, so that we can eliminate some of our buffing. Our present silver plating is dull and frosty in appearance.

W. A. A.

**Answer:** The only method for producing surfaces on silverware similar to buffed surfaces is by electropolishing. Even then there is a certain difference in the character of the surface, but for most purposes the electropolished finish is suitable. It is also possible to incorporate brightening agents in the silver plating bath that will permit you to deposit the silver in a lustrous condition. A number of bright silver baths are available commercially, and names of suppliers are being sent to you.

### Cleaning Soldered Joints on Gold Ware

**Question:** In manufacturing chain bracelets we have to solder 14K gold wire. An oxide forms at this joint that is difficult to remove, especially since it is not possible to reach all areas of this joint with a buff or wire wheel. Can you tell us if there is any solution that can be used for getting rid of this oxide condition without harming the gold wire?

V. W. P.

**Answer:** The following solution has been used very successfully in removing heat and solder scale from gold alloys:

Sulfuric Acid \_\_\_\_\_ 14 fl. oz./gal.  
Sodium Dichromate \_\_\_\_\_ 5 " "

This solution is used hot, and will usually remove the scale in a matter of a few minutes.

### Plating Over Soft Solder Joints on Brass

**Question:** We are silver plating rectangular tubes which sometimes have brass plugs soft soldered into one end. We use a silver strike, followed by silver plating, and often experience poor adhesion of the silver over the soldered joint. Can you suggest something that will enable to do this successfully?

S. S. R.

**Answer:** The soldered parts should first be thoroughly cleaned of any remaining flux or flux residues from the soldering operation. This can be done by degreasing, followed by alkaline cleaning in a mild cleaning bath, cathodically. A dip in 10% fluoboric acid, rinse, dip in weak cyanide solu-

tion should follow before the silver striking is done. Low C.D. in the cleaning bath is essential.

### Iron Contamination In Nickel Plating

**Question:** We are having trouble with build-up of iron in our nickel solution. Every time we check the iron content it seems to rise, yet the only metals we plate in this solution are die-castings and brass forgings. Where could the iron be coming from? Is it possible that the small amount of iron in these metals is being leached out in our plating solution?

R. M. T.

**Answer:** The iron build-up is not coming from the alloys being plated. We suggest that you empty the tank and inspect the lining carefully, as it is probably punctured, exposing the steel shell. If so this spot must be recoated at once.

If the iron content is excessive, you can get rid of it by oxidizing and raising the pH by adding peroxide and nickel carbonate, followed by filtering.

### Nickel Plating Anode and Cathode Rods

**Question:** Recently we visited the plating plant of another manufacturer and noticed that they had plated their work rods and anode rods with something which looked like nickel. Can you tell us what this is for and what advantages it might have?

F. T. N.

**Answer:** We assume that you are talking about the rods in the nickel plating tank. Many operators prefer a nickel plated rod as this eliminates the possibility of copper contamination due to chemicals dripping over these rods and dissolving small amounts of copper which later drips down into the bath. Another scheme that is used is to first clean the rods thoroughly, then wrap thin plastic sheeting around the rods and anode hooks. Work rods cannot be treated this way of course, but it does in-

sure continued good anode rod contact and some alleviation of possible copper contamination.

### Making Up Brass Bath With Copper Anodes

**Question:** We are interested in a method for using some scrap copper of good quality for making up a brass plating solution. Do you know of a way this can be done without requiring copper salts?

O. G. R.

**Answer:** The scrap copper can be placed in an anode basket and dissolved in a sodium cyanide solution by electrolysis until a substantial amount of double copper sodium cyanide has been formed. The zinc cyanide and other chemicals could then be added in correct amount to make up a balanced formulation for brass plating. It is possible to operate a brass solution using separate copper and zinc anodes, but control of the process is then very difficult, requiring close control of relative anode surface areas and very frequent analyses of the solution. A better method for using up the scrap copper, after dissolving enough in the sodium cyanide bath to form the double cyanide, would be to melt them with the correct amount of zinc to make cast alloy anodes.

### Disposal of Silver Plating Solution

**Question:** We would like to know how to effectively neutralize a silver cyanide plating solution before disposing of it. Can you give us this information?

B. J. J.

**Answer:** The first step should be to recover all the silver possible from the solution. You can do this by using stainless steel anodes and cathodes and plating until there is no more deposition of silver. The cathodes can be re-used for further plating. Before dumping the solution to the sewer it will then be necessary to destroy the cyanides. One of the easiest ways to do this is to bubble chlorine gas through the solution until the residual cyanide content is reduced to not over several parts per million. This chlorinating operation should be conducted out in the open and away from nearby buildings. After destruction of the cyanides, the bath can usually be diluted and run into the sewer, but we

advise consulting your local health authorities before doing this.

During chlorination some white precipitate may be formed, which is silver chloride. This has a salvage value, and can be filtered off and sold to a silver refiner for processing and recovery of the metal.

### Testing for Chromate Film on Zinc Plate

**Question:** On some of our parts we are asking the supplier to put a thin clear chromate film over the bright zinc plating. There are times when it looks like the parts have not received this treatment, and our inspection department would like to know if there is some simple test that could be applied to these clear films to verify their presence?

A. P. N.

**Answer:** Usually the chromate film will show some iridescence if held at

eye level and tilted to reflect the light properly. However, a positive test can be made with the following reagent:

Distilled water	40 ml.
Glacial acetic acid	60 ml.
Diphenylcarbazide	1 gm.
Wetting agent (Sulfonated alcohol type)	.1 gm.
Hydrochloric acid	15 ml.
Sodium hypochlorite (10-15% solution)	30 ml.
Hydrogen peroxide (100 volume)	5 ml.

The solution is made up by adding the ingredients in the above order. The solution should stand for 24 hours before using, but after that is fairly stable.

A drop of this solution is applied to the part in question. A red or purple color will develop within one minute if a chromate film is present.

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## Bright Nickel Plating Electropolished Brass

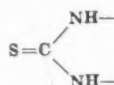
U. S. Patent 2,563,229. C. L. Faust  
and J. G. Beach, assignors to Battelle  
Development Corp.

The method of producing an adherent bright nickel plate on an electropolished brass surface which comprises rinsing the aforesaid brass surface, immersing the rinsed brass surface in a 10% sulfuric acid solution containing 0.5 to 10.0 ounces per gallon of oxalic acid, rinsing the brass surface again, and finally plating said brass surface with a bright nickel plate.

## Bright Acid Copper Bath

U. S. Patent 2,563,360. W. M. Phillips  
and F. L. Clifton, assignors to General  
Motors Corp.

An electrolyte for electrodepositing bright or semi-bright copper consisting essentially of an aqueous acid solution of copper sulphate and free sulphuric acid and having dissolved therein a compound having the nucleus



said compound having a concentration in said solution within the range of 0.002-5 grams per liter.

## Coating for Aluminum Alloys

U. S. Patent 2,563,430-431 F. P. Spruance, Jr., assignor to American Chemical Paint Co.

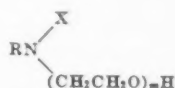
In the art of coating aluminum to increase its resistance to corrosion and abrasion where the surface of the metal is coated by the action of an acid aqueous solution, the essential coating-producing ingredients of which are fluoride ions, dichromate ions, and ions from the class of acids consisting of phosphoric and arsenic acids; the method which consists in treating a surface so coated with an aqueous solution of a non-alkali metallic chromate having a solubility in the chromic acid sufficient to yield a concentration of at least 5 but not more than

250 grams per liter calculated as  $\text{Zn-CrO}_4$  the treating solution being characterized by having a pH of from 3.5 to 6.0 and a free to total acid ratio of 1:1.5 to 1:2.5.

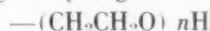
## Stainless Steel Pickling Bath

U. S. Patent 2,564,749. E. A. Bried, assignor to Hercules Powder Co.

An aqueous pickling bath solution for stainless steel containing, in amounts based on the weight of the solution, besides a complement of water about 5 to 20% of nitric acid, about 1 to 5% of hydrofluoric acid and about 0.001 to 3% of a glycol ether of an ethanol rosin amine having the general formula



where R is a radical of the group consisting of dehydroabietyl and hydroabietyl, X is a radical of the group consisting of hydrogen and



and m is an integer from 10 to 40 and n is an integer from 1 to 30, the sum of m and n being within the range of 11 to 40.

## Anode Basket

U. S. Patent 2,559,926. J. D. Beebe, assignor to John C. Schwartz.

An anode basket for immersion in an electrolyte comprising an electrically conductive hopper, a metallic structure in substantial resemblance of a coil spring having two top coils closed upon each other and integrally secured to said hopper, a plurality of intermediate open coils and a plurality of lower coils closed upon each other and of diameter which decrease upon approach to the lower end thereof, said structure being covered with insulation except at the region of attachment thereof to said hopper and containing anode metal, a non-conductive liner of substantially cylindrical shape within said coils extending from the bottom of said hopper downwardly into said lower coils, said shield having a series of openings circumferen-

tially confined to one-half thereof to define the area of electrolytic material contained therein to be exposed to the electrolyte.

## Anodic Stripping of Plated Coatings from Steel

U. S. Patent 2,561,222. F. Passal, assignor to United Chromium, Inc.

A method of stripping nickel, chromium, silver, tin, lead, copper, zinc and cadmium electrodeposits from ferrous basis metal consisting essentially in immersing, as an anode, a ferrous basis metal having an electrodeposit of one or more of the aforesaid electrodeposits thereon, in an aqueous bath consisting of 200 g./l. (plus 100% or minus 50%)  $\text{NaNO}_3$  and 100 g./l. (plus 100% or minus 50%)  $\text{CrO}_3$ , and passing a direct electric current from said anode to a cathode.

## Control Circuit for Periodic Reverse Plating

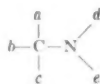
U. S. Patent 2,564,823. E. H. Wallace, assignor to Oneida, Ltd.

An electric circuit for controlling a direct power source supplying to the electrodes of an electrolytic cell, a potential-varying with the load, said circuit comprising a coil actuated reversing relay for connecting the power source to the cell electrodes, a vacuum tube having a plate, a cathode and a grid, said cathode and grid being connected respectively to the cathode and anode of said cell so that the voltage difference between the anode and cathode of the cell is impressed upon the grid, said plate being connected in series with the actuating coil of the reversing relay to energize the reversing relay when the potential difference between the anode and cathode of the cell reaches a value which will cause the tube to conduct, and a timing device having a switch interposed in the circuit of the plate and the coil to deenergize the reversing relay and reconnect the anode and cathode of the cell with the original polarity after the elapse of a time interval from energization of the solenoid sufficient substantially to depolarize the cell.

### Electropolishing Metals

U. S. Patent 2,565,189. C. J. Wernlund, assignor to E. I. du Pont de Nemours & Co.

The process for electropolishing metal articles selected from the group consisting of malleable iron, steels, copper, brass, aluminum and electrolytically deposited chromium which comprises anodically treating said articles in an electrolyte consisting of 0.01 to 30% by weight of water and the hydrogen fluoride salt of an organic nitrogen base capable of reacting with hydrogen fluoride to form a salt which is liquid in the presence of 0.01 to about 30% by weight of water at a temperature below its decomposition temperature, said base being selected from the group consisting of cyclohexylamine, the heterocyclic organic bases and amines having the type formula:



where *a*, *b*, *c*, *d* and *e* each represent a radical selected from the group consisting of hydrogen, alkyl, hydroxyalkyl, aminoalkyl and phenyl.

### Hot-Dip Aluminum Coatings

U. S. Patent 2,565,768. D. O. Gittings, assignor to U. S. Steel Co.

The method of hot-dip coating ferrous base metal with aluminum comprising adding beryllium in effective amounts from about .1% up to 2% to the molten coating bath, maintaining the molten bath at a temperature below 1300°F. and dipping ferrous base metal having cleaned surfaces therein.

A hot-dipped coated product comprising a ferrous metal base and an outer layer of beryllium-containing aluminum having a thin relatively soft beryllium-containing iron aluminum alloy layer there between and resulting from the process of claim 4.

### Antimony Coating on Steel

U. S. Patent 2,564,661. A. Arent.

The process for treating ferrous metal surfaces which comprises applying an alkali metal silicate solution to the surface to be coated, wetting the coated surface after drying with a strong solution having antimony ions and an excess of chloride ions therein for an interval sufficient to induce a surface reaction between antimony,

the base metal and water glass constituents, and drying the surface so reacted after metallic antimony has deposited on said surfaces.

### Strip Polisher for Both Sides

U. S. Patent 2,567,163. D. A. Wallace, assignor to Chrysler Corp.

In a device for simultaneously polishing both sides of a sheet metal strip, a casing having walls defining an elongated tank having vertical slots in opposite end walls thereof to receive a portion of the metal strip so that the strip may extend through the tank in a vertical plane, a pair of coaxial horizontal shafts extending transversely of said casing, stones carried within said tank by each of said shafts, each of said stones having a flat abrading surface located substantially in the plane defined by said slots, said abrading surfaces thereby being adapted to cooperate to engage opposite sides of a sheet metal strip extending through the tank and between said abrading surfaces, a power driven reel located exteriorly of said casing adjacent one end wall thereof and operable to pull a sheet metal strip through said tank, a collar associated with each of said shafts, each of said collars circumscribing one of said shafts for relative rotation therebetween and having an outer cylindrical surface eccentric to its associated shaft, a bearing associated with each of said collars and in which the collar is journaled for rotation, power means drivingly connected with each of said shafts to rotate said shafts in said collars, power means drivingly connected with each of said collars to rotate said collars in said bearings, opposed walls of said casing being provided with elongated openings each penetrated by one of said bearings and in which said bearings are mounted for reciprocation, and a power means associated with each of said bearings including a power driven rotatably mounted eccentric element having a connecting rod connected to one of said bearings for reciprocation of said last-mentioned bearing in its associated opening so that as the sheet metal strip is pulled through said tank by said power driven roll means opposite sides of the strip are engaged by the abrading surfaces of said stones, each of which move in a path defined by rotation of its associated shaft, the revolving of its shaft induced by rotation of its

associated collar and the reciprocation of its associated bearing.

### Salt Bath Descaling

U. S. Patent 2,567,456. H. G. Webster, assignor to J. H. Shoemaker.

Descaling and degreasing composition for grease and scale coated alkali resistant metals for use in molten bath form comprising a mixture of about nineteen parts by weight of alkali metal hydroxide, about nineteen parts by weight of alkali metal nitrate and about one part by weight of alkali metal chloride.

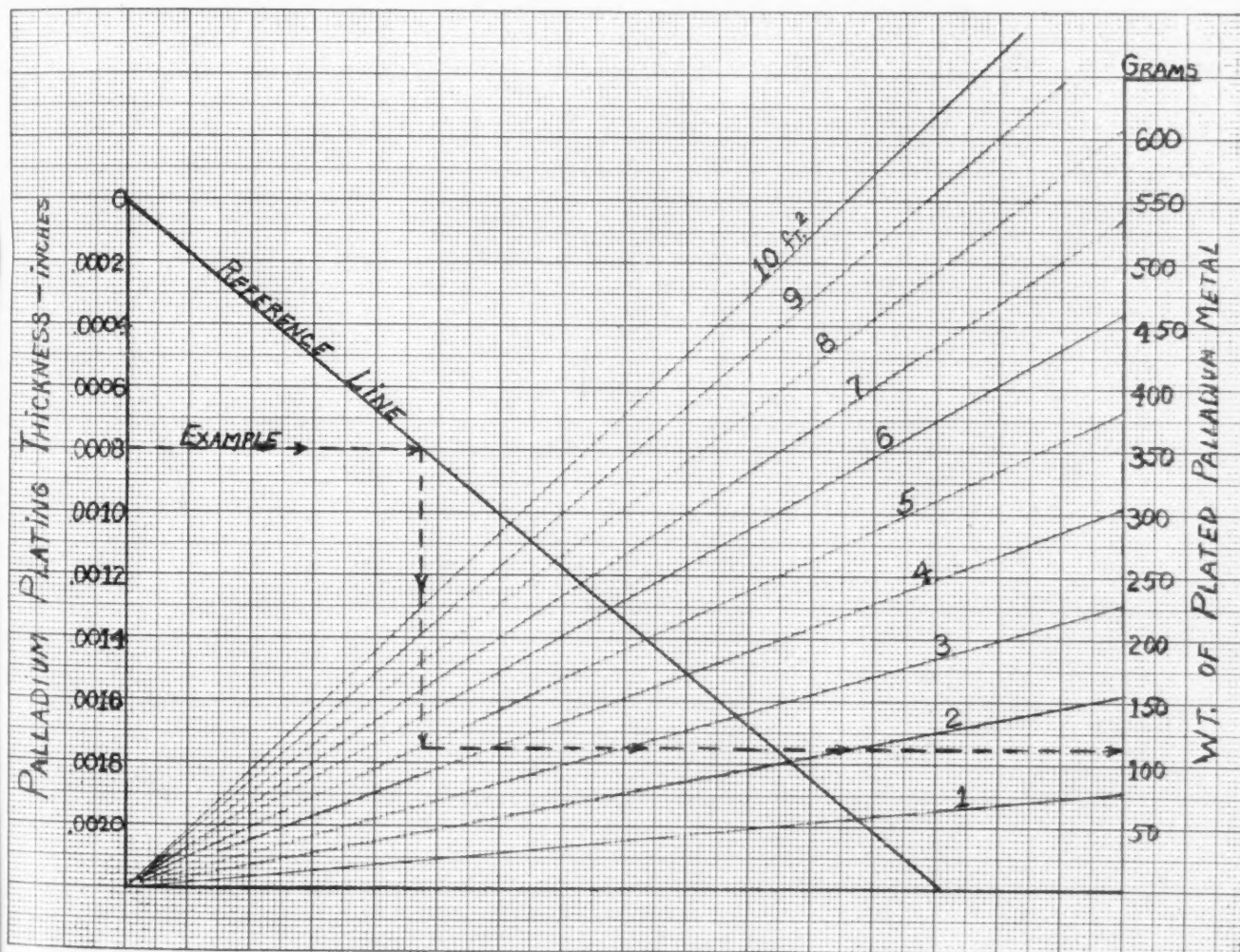
A two step non-electrolytic process for cleaning the surfaces of alkali resistant metals, having substantial amounts of oxidizable organic materials thereon, such as oils, greases etc., as well as oxidized portions of the metal, such as scale etc., to be removed, wherein each step is in the nature of a chemical reaction, and wherein the second step leaves no added finish to the surface, and wherein the first step comprises immersing the metal in a bath comprising a molten mixture of approximately 19 parts by weight of alkali metal nitrate, approximately 19 parts by weight of alkali metal hydroxide and approximately 1 part by weight of alkali metal chloride, for a period of time sufficient to remove any organic surface impurities and convert inorganic surface impurities to an oxidized coating, more readily soluble than were the original inorganic impurities, the operating temperature of the first bath being above the melting point of the molten mixture, and wherein the second step comprises immersing the metal in a bath of a dilute acid selected from the class consisting of hydrochloric and sulphuric acids, whereby when the metal is immersed therein for a proper period of time, the bath will react chemically with the oxidized coating to remove it, so as to leave the surface free of the original impurities and of the oxidized coating as well, the second step, however, being such as not to expose at the surface other impurities, not previously existent, or not previously exposed, thus leaving the surface free of all impurities and consisting solely of the metal, the immersion in the second bath being sufficiently brief so as not to permit the acid to attack the metal, but merely to remove the oxidized coating formed by the first step.

## Calculating Metal Cost for Palladium Plating

The chart below simplifies the metal weight and cost calculations for palladium plating. The example shown is for calculating the cost of plating .0008" of palladium on a surface area of 5 square feet. Lighter coatings than shown in the table can be calculated using appropriate factors. For example, .00008" of palladium on the above area would be 1/100 of the above example.

Metal weights are given in grams.

$$\text{Grams} \times .0322 = \text{Troy ounces}$$



### CORRECTION

In the December 1951 issue, Data Sheet for "Calculating The Metal Cost for Rhodium Plating," the weight of plated metal column (extreme right) should have read "pounds" instead of "Troy oz."

$$\text{Pounds} \times 453.6 = \text{grams.}$$



#### New Alkaline Derusting Process

*Enthone, Inc., Dept. MF, 442 Elm St., New Haven, Conn.*

Announcement of the development of a new alkaline derusting process for steel, cast iron, malleable iron and other iron alloys is made by this firm. The process is stated to be unique in that no acid is required in the procedure, with the attendant advantages of elimination of subsequent rusting, no attack on the base metal, and speed of operation. High carbon steels that are prone to be discolored even in inhibited acids can be rapidly de-rusted without any trace of tarnish or attack. Because the process is alkaline in nature, it simultaneously cleans and derusts. The solution can be operated in a steel tank at room temperature. The work to be derusted is made the cathode in a solution of Enthone Derusting Compound for from a few seconds to several minutes depending upon the condition of the surface. Tests made comparing the speed of derusting with hot sulphuric or cold hydrochloric acids have shown that derusting can be accomplished in a fraction of the time. This is important where high speed pickling of wire or

strip must be accomplished. Large objects formerly thought to be unusable because of heavy accumulation of rust can now be reclaimed.

If protection of the object being derusted is desired, zinc can be incorporated in the bath to enable cleaning, pickling and zinc plating all in one tank.

A wide range of current density can be employed, from five to several hundred a.s.f. Speed of derusting is dependent upon the current density used. The bath is simple to control and is done by titration. After derusting, the object is clean and bright. Longer treatment does not result in any attack upon the metal being pickled.

One of the chief advantages claimed for the process is due to the fact that it is alkaline and there is no tendency to cause surrounding equipment to be corroded, such as occurs with acid pickling processes. In addition, subsequent rusting of the part that is derusted is not accelerated, whereas, with acid pickling, traces of acid trapped in the pores may leak out and cause accelerated rusting and corrosion.

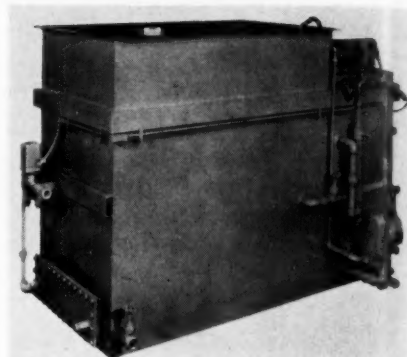
The salts making the derusting bath are sold under the designation "Enthone Derusting Compound 134." They are supplied as an alkaline powder in steel drums.

#### New Design of Solvent-Vapor Degreaser

*Detrex Corp., Dept. MF, Detroit 32, Mich.*

A completely redesigned and improved model of a hand-operated, solvent-vapor degreaser is announced by Detrex Corp.

The production cleaning machines included in this new series, identified as VS-300, make use of non-flammable chlorinated hydrocarbon solvents, either trichlorethylene or perchlorethylene for the complete and high-speed removal of oil and grease from all kinds of metal products. The usual cycle of operation is vapor cleaning, then flooding clean solvent over the



work with a hand held spray lance, followed by the usual pure vapor cleaning phase which is characteristic of solvent-vapor degreasing.

A minimum of floor space, lower working height, and an efficient new style solvent condenser are some of the improvements featured. As the clean-solvent storage tank is built integral with the main machine body, the new design has made it possible for the inside work space to be cleared of all projections, including the solvent collecting trough, condensing coils, and vapor level control bulb, thus providing unobstructed entrance for work being cleaned. Easy operation from either side of the machine is also made possible because of the relocation of the solvent storage space.

Further refinements include: simplified piping and water separator arrangement, large access door for easy cleaning of the solvent storage section, and a redesigned condenser coil that provides a greater volume of distillate for slushing. A standard heating-door opening is provided to accommodate the interchange of heating means, consisting of steam coils, gas burners or electric elements.

A new, improved type of corrosion-resistant coating, called FF-1, is applied to all interior surfaces of the VS-300 model degreasers. In addition to twenty-one standard sizes in which this model is available, "specials" will be built to fit individual product requirements.



Dr. Walter R. Meyer, inventor of processes for derusting of steel, shown with typical parts that have been derusted.

### Hull Cell Rectifier

R. O. Hull & Co., Inc., Dept. MF,  
1305 Parsons Ct., Rocky River 16, O.

Added convenience features, as well as simplicity and dependability of the new Rohco Comet Rectifier are announced by the above firm.

Designed for Hull Cell control or other small-scale plating operations, the Rohco Comet Rectifier is a modern control necessity for the plating of chromium, bright nickel, zinc, cadmium, brass and copper.

The specifications of interest to platers are—Input: 110 volts, 60 cycles AC, single phase. Output: 0-6 Amps. at 0-18 volts; 0-30 amps. at 0-15 volts. Minimum ripple—Heavy-duty rectifiers for continuous operation. Ammeter: Dual range, 0-6; 0-30 amps. Voltmeter: Single range, 0-20 volts. Stepless voltage control: 0-full load. Timer: Interval timer, 0-5 minutes with manual stop. May be switched in or out of circuit. Dual convenience outlets: For 110 volt accessories.

### Bench Model Wet Blaster

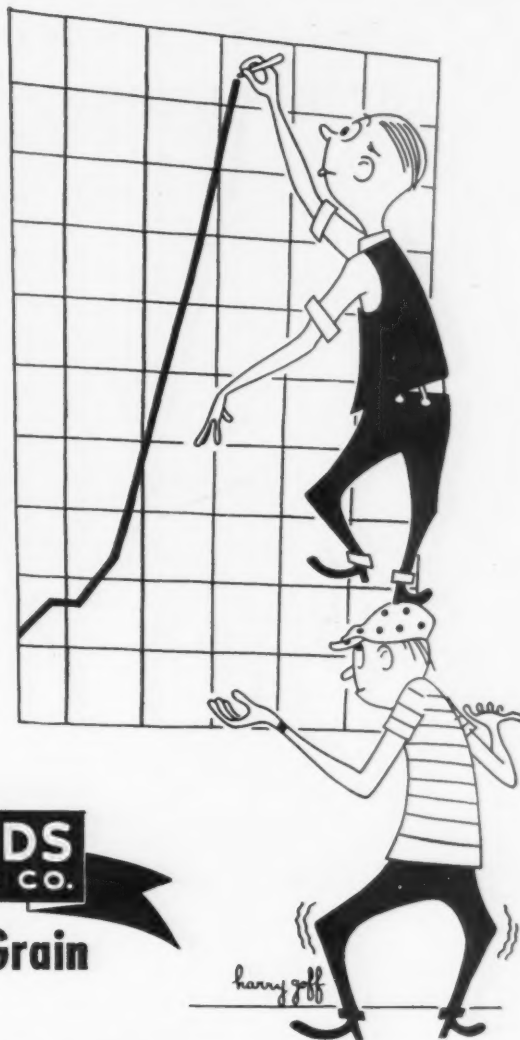
The Cro-Plate Co., Inc., Dept. MF,  
747 Windsor St., Hartford 5, Conn.

The above company announces the newly-redesigned "Pressure-Blast, Jr." This new bench model wet-blasting unit features the elimination of the usual troublesome pump, replacing the pump function by the siphoning action of the compressed-air operated jet gun.

Used for deburring, descaling and general surface cleaning, the "Pres-



*They're  
reaching  
a new  
production  
record!*



**SIMONDS**  
ABRASIVE CO.  
**Abrasive Grain**

Production moved up, polishing costs moved down when the right abrasive grain moved in. Simonds Abrasive Company Borolon grain, of course—right for all *your* polishing jobs—and part of a complete line of grinding wheels of all shapes and sizes, mounted wheels and points, segments and abrasive grain ... all manufactured under complete quality control by Simonds Abrasive Company, a major producer of grinding wheels for almost 60 years. Write for Bulletin ESA 198, which describes various types of Borolon Grain. Also request name of your nearest distributor.

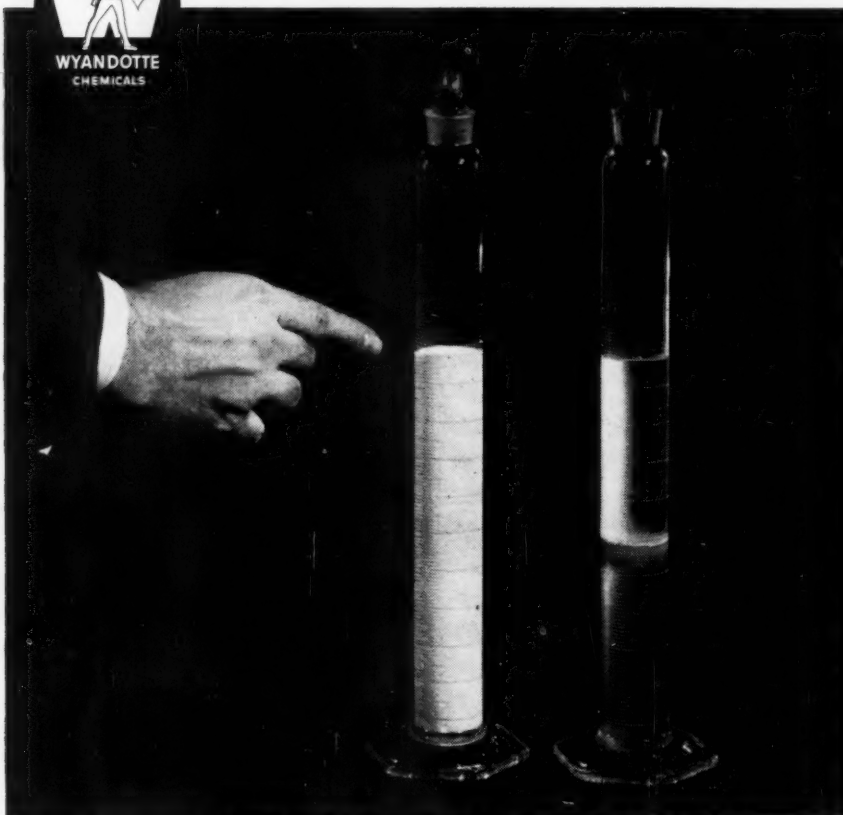


SIMONDS ABRASIVE CO., PHILADELPHIA 37, PA. BRANCH WAREHOUSES: CHICAGO, DETROIT, BOSTON  
DISTRIBUTORS IN PRINCIPAL CITIES

Division of Simonds Saw and Steel Co., Fitchburg, Mass. Other Simonds Companies: Simonds Steel Mills, Lockport, N. Y., Simonds Canada Saw Co., Ltd., Montreal, Que. and Simonds Canada Abrasive Co., Ltd., Arvida, Que.



**Specialists in Industrial Cleaning Products**



*MK Emulsion—another helpful Wyandotte Chemicals product at work*

## **Increase the life of your soak cleaners up to ten times**

**H**ERE'S proof that Wyandotte MK EMULSION vastly improves emulsification, has greater soil tolerance!

Compare the two graduates above. Note the amazing difference in emulsification!

In each case, 100 ml. mineral oil has been added to the solution. While the oil is only slightly emulsified in the graduate on the right, almost complete emulsification has been achieved in the solution to the left!

### **The difference is MK Emulsion**

The same standard alkaline soak cleaner was used in each case. On the right, an 8-oz.-per-gal. solution of the cleaner was used. But on the left, the solution is 4 oz. of standard cleaner plus 4 oz. MK EMULSION to the gallon.

By substituting MK EMULSION for

one-half of the soak cleaner used in the solution, *emulsification was vastly increased.*

### **Cuts cleaning time in half**

This test *proves* that a small addition of MK EMULSION to your alkaline cleaner greatly increases soil tolerance. In actual production, as in this and other laboratory tests, MK EMULSION —(a) extends the life of an alkaline soak cleaner by as much as 10 times, and—(b) speeds up cleaning action, cutting cleaning time to as little as one-half the usual time!

Ask your helpful Wyandotte representative for further data. Wyandotte Chemicals Corporation, Wyandotte, Michigan; also Los Angeles, California.



**Largest manufacturers of specialized cleaning products for business and industry**



**Wyandotte CHEMICALS**

*Helpful service representatives in 88 cities in the U.S. and Canada*

sure-Blast, Jr." is said to be easily installed . . . requires only one 3/8" water connection, one 3/8" air connection (standard shop pressure) and a single 110 volt line for blower operation and lighting. Of stainless steel construction with copper plumbing, the new model uses any abrasive from 75 to 5,000 mesh.

Further details on the unit may be obtained by writing directly to the above address.

### **Special Plating Processes**

*Hanson-Van Winkle-Munning Co., Dept. MF, Matawan, N. J.*

This company offers to the plating industry a new and revised condensed description of special H-VW-M electroplating processes. Bright, high speed processes are described for the electroplating of cadmium, zinc, copper, nickel, and silver, along with information on improved methods for lead plating. For those interested in any particular process, they have technical manuals illustrating and describing the various processes in detailed form.

Write to the above address.

### **Low Ripple Rectifiers**

*W. Green Electric Co., Dept. MF, 130 Cedar St., New York 6, N. Y.*

Green Electric have officially announced that they can build any of their larger Selectro-Platers with full-wave low-ripple circuit. This means that rectifier units rated as low as 6 volts maximum can be obtained which will deliver DC with a ripple of less than 5% r.m.s., and with no sacrifice of efficiency or other performance characteristics. The statement is said to be backed by observations on large low-ripple units which have been in operation for over six years.

Green Electric note that although their wye-type units with a ripple of about 18% have been entirely successful during the past eleven years in every kind of process including chrome, some platers feel that still lower ripple might be preferable for some of the newer processes. Further particulars are available on request.

### **Rigid Plastic Pipe and Fittings**

*Munray Products, Inc., Dept. MF, 12400 Crossburn Ave., Cleveland, O.*

To augment its broad line of flexible, semi-rigid and rigid plastic tubing and pipe, this firm now brings to



the nation's process industries its Polydur 162—claimed to be the first non-plasticized polyvinyl chloride pipe produced in this country by continuous extrusion methods.

Polydur is a rigid, high molecular weight pipe remarkable in its ability to be both hard and tough at the same time. It is extruded in extra heavy wall pipe up to and including 2". At temperatures below 170°F. it is capable of conducting acids, alkalies, salts, oxidizing agents, oils, greases, alcohols, gasoline, carbon tetrachloride, etc. It can be machined, welded, threaded and even formed by heating it above 250°F. Plain end or flange pipe can be furnished in standard lengths of 10 or 25 feet.

Polydur's impact strength is claimed to remain high even at sub-zero temperatures. It will not become brittle, neither will it deteriorate with age. Its water absorption rate is low; it is completely self-extinguishing; and, it is a good dielectric. Where its temperature limits permit, Polydur obsoletes heavy metal pipe, expensive alloys and cumbersome ceramic pipe in many applications. It is corrosion proof throughout, eliminating protective coatings and other costly maintenance nuisances.

Complete details and engineering data may be obtained by writing.

#### Emergency Showers

Logan Emergency Showers, Inc.,  
Dept. MF, P.O. Box 111, Glendale,  
Calif.

Despite broad-scale, educational programs and the employment of all available safety devices, industrial accidents cannot be entirely eliminated. When they do occur serious consequences can be avoided only when means are readily available to meet the emergency. Foremost in this category are emergency or decontamination showers which have been designed to spray water to rapidly quench fire, or in a matter of seconds dilute and remove acids or other chemicals and foreign materials contaminating clothing or the human body.

The new Logan showers are offered in three basic models to meet the requirements of maximum, medium or minimum exposure. The model designed especially for maximum exposure is designated as Series 5010. Ingeniously located sprays enables this model to instantly wet and wash all

# FREE

ASK FOR  
BOOKLET  
No. B1



## IF YOU PRODUCE PARTS THAT REQUIRE FINISHING OF ANY KIND

This 22-page booklet is guaranteed to open your eyes! It gives you the inside story of advanced barrel finishing as never told before!

In the last five years, barrel finishing has made rapid advances. Only those directly connected have been able to keep up. Only 30% of the nation's manufacturers are benefiting from the tremendous cost savings and improved finishes made possible by these advances.

Now is the time to investigate this labor-saving, cost-cutting method. ALMCO barrel finishing equipment has completely paid for itself in as little as two months! This is easy to understand. A single unit installation replaces from two to twelve men. Savings run as high as 95%.

"Advance Barrel Finishing" is the only mass deburring, grinding and finishing method where results are controlled. Amazing results are now possible on almost all types of parts from large castings to small intricate parts. Close tolerance parts can be finished with absolute uniformity to almost any desired micro-inch reading.

WRITE TODAY FOR YOUR FREE COPY

## ALMCO Supersheen

AMERICA'S LARGEST MANUFACTURER OF ADVANCED BARREL  
FINISHING EQUIPMENT—MATERIALS AND COMPOUNDS

ALBERT LEA, MINNESOTA

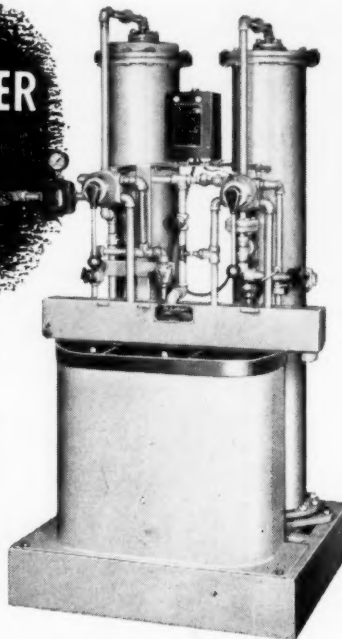
**CHEMICALLY PURE WATER**

*is Cheap*

only a few cents a thousand gallons

## with **INDUSTRIAL** Water Demineralizers

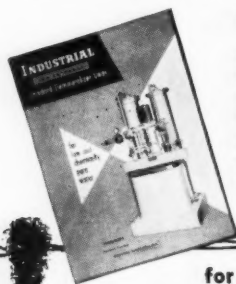
A two-bed INDUSTRIAL demineralizer unit. Standard units are available with capacities of 200 to 1000 gph. Special units of any capacity are engineered to requirements.



**Eliminate**

**UNWANTED PRECIPITATES  
HOT WATER RINSE STAINS**

These two difficulties in plating can be eliminated with one stroke—chemically pure water. Pure water in plating solutions improves the over-all quality of plated coatings. The use of pure water for hot rinses prevents stains and water marks after drying. With an INDUSTRIAL demineralizer chemically pure water costs so little that the unit pays for itself in a short time. It's easy to install and operate, and requires very little floor space.



### Write for Bulletin 200

or send us a water analysis, letting us know the amount of treated water required in gallons per hour, and whether intermittent or continuous flow is needed. We will then give you the whole demineralizer story, including estimated cost, equipment required, performance data, etc. for your requirements.

for solution clarification . . .

## **INDUSTRIAL Filters**

A typical INDUSTRIAL stationary filter. Standard portable and stationary models are available with capacities 100 to 15,000 gph. Special filtering systems are engineered to meet unusual requirements.



Write for Full Information and Recommendations

## **INDUSTRIAL FILTER & PUMP MFG. CO.**

5906 Ogden Avenue  
Chicago 50, Illinois

FILTERS   PUMPS   CORROSION TESTING APPARATUS  
Pressure Type   Centrifugal   Salt Fog • Humidity

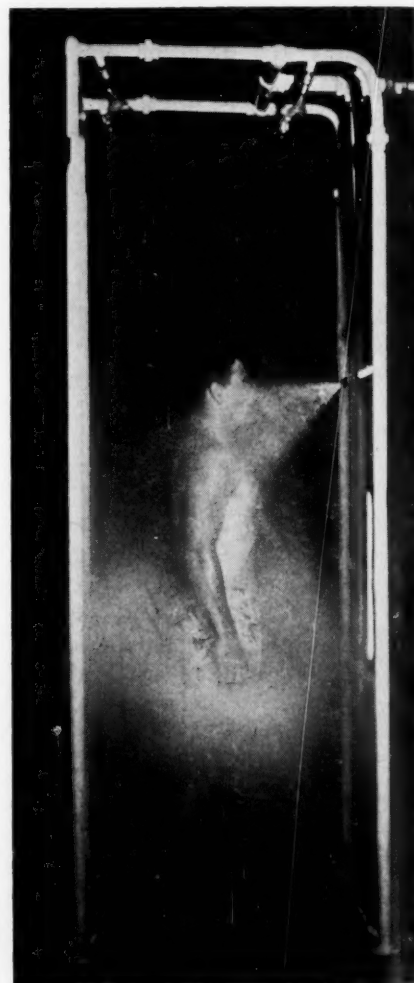
RUBBER DIVISION  
Vulcanized Linings • Molded Products

WATER  
DEMINERALIZERS

portions of the clothing and body. Tests with a high-viscosity water-soluble test material are claimed to show that all material is completely removed from all parts of the body, without rubbing, in only 15 seconds.

This amazing speed is accomplished by locating the sprays so that all parts of the body are reached simultaneously. For example, in addition to the orthodox overhead sprays there are four bottom sprays directed upward to reach under smocks, coats, etc. Water directed in this manner assures thorough wetting between the legs, under the buttocks and calves of the user. The feet are reached by four streams directed from holes at the base of the shower, which also act as drains. In addition, two special sprays play on the eyes and face without interfering with sight or breathing.

This high-speed shower is built so that it can be entered from two sides and instantly activated by the slightest pressure on a gate which swings in either direction. The valve remains open after being activated until manually closed, thus leaving user's hands free.



This shower is made for either inside or outside installation. For outdoor use valve is located below the frost line. Other models are also available for lighter duty or special conditions.

#### Resistance Thermometers for Industrial Processes

General Electric Co., Dept. MF, Meter & Instrument Dept., Schenectady, N. Y.

A new line of resistance thermometers designed for accurate indication and control of temperatures ranging from minus 100°F. to plus 300°F. has been announced by the above firm.

The new instruments, applicable in a wide variety of industrial processes, are available in three basic types: the HP-11 resistance-thermometer indicator; the HP-13 two-position controller or protector; and the HP-14 three-position controller. Each type is designed for either flush or surface mounting.

All the thermometers use the same basic mechanism, a crossed-coil moving element and a high-strength  $3\frac{1}{4}$  pound alnico V magnet, designed for hard usage and reliable operation. The entire mechanism is enclosed in a dust-tight, moisture-resistant case-and-cover assembly that permits its use in moist or contaminated atmospheres, it is claimed.

Typical examples of equipment with which the thermometers are used include enamel baking ovens, vacuum dryers, low-temperature extruding machines, quenching tanks, distillation kettles, rubber vulcanization apparatus, and aging ovens.

#### Steel Phosphating Compound

Kelite Products, Inc., Dept. MF, 3401 West Touhy Ave., Chicago 45, Ill.

Kelite Keykote is a new powdered material developed for phosphatizing steel and iron at low concentrations.

An unusually fine powdered material, Kelite Keykote operates in pH range as low as 3.

No stainless steel equipment is required when you use Kelite Keykote. Inexpensive black iron tanks may be employed which can be heated by immersion heaters, steam coils, or burners under tank.

Kelite Keykote will not "sludge out," it is claimed. No screen is necessary

# COMPARE

## your present ALUMINUM FINISHING PROCESS with these advantages of **IRIDITE**<sup>®</sup> Al-Coat

—see for yourself why more and more finishers of aluminum products are specifying Iridite Al-Coat for any wrought, cast or buffed aluminum part.

### 1. IN PROCESSING

**Faster**—Just one simple dip, 10 seconds or only two minutes, depending upon your finishing specifications. No sealing dip, no special drying.

**Simpler**—Non-electrolytic, no heating or exhaust units, operates at room temperature. No special precleaning baths required.

### 2. IN APPEARANCE

**Clear**—Protects metal without changing its original appearance.

**Colored**—Heavier, iridescent yellow film provides greater protection.

### 3. IN PERFORMANCE

**Corrosion Resistance**—Up to 1,000 hours salt spray on wrought stock, 250 hours on castings. Approved under government specifications.

**Abrasion Resistance**—Will not flake or peel from buffing, bending or scraping.

**Paint Base**—Blocks underfilm corrosion; grips paint, holds it firmly.

**Welding**—Finished surface can be spot welded, coating actually aids shielded arc welding.

**Conductivity**—Offers low surface resistance to electrical current.

### 4. IN COST

Comparative figures show that Iridite Al-Coat saves as much as 50% over other aluminum finishing processes. *Let us prove this to you.*

**Write today for FREE SAMPLES of Iridite Al-Coat. Or, send samples of your product for test processing.**

Iridite is approved under government specifications.



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INCORPORATED

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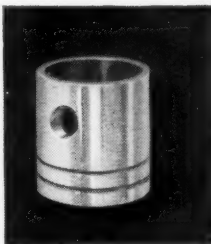
REPRESENTATIVES IN PRINCIPAL INDUSTRIAL CITIES, West Coast: L. H. BUTCHER COMPANY  
Manufacturers of Iridite Finishes  
for Corrosion Resistance and Paint Systems for Non-Ferrous Metals; ARP Finishing Chemicals.



From finishing hand tools . . .



to sanding forged aluminum



## Armour Backstand Belts do the job right

For the thousand-and-one jobs the backstand belt can do easily and profitably, for the other thousands of jobs coated abrasives do so well, Armour has the answer—there's an Armour coated abrasive to do *your* job right.

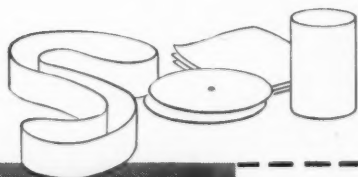
### Toledo Steel Tube Co. saves time

2 hours per operation per day—that's the time the Toledo Tube Co. saved by switching to backstand belts. In removing burrs and grip marks from tubing, they found Armour Coated Abrasives cut faster, last longer, give a better finish.

Armour has one of the most modern plants in the coated abrasives industry. Belts are only one of the many forms of coated abrasives available to you—more than 30,000 different varieties in grip size, backing, etc. Sheets, rolls, discs, tubes—and specialty sizes to meet your specifications, if you need them.

Conserve your stocks of coated abrasives. Write for our free booklet on "How to Store Coated Abrasives."

We recommend buying through  
your industrial distributor



**ARMOUR**

*Coated  
Abrasives  
Division*

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Please send me the free informative booklet "How to Store Coated Abrasives."

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in immersion tanks, and no powder deposits remain on work, according to the firm.

Keykote can be applied either by spray or immersion. It can be rinsed if called for, but this is not necessary.

Especially compounded for rapid coatings, the normal immersion time is one to two minutes. Longer periods will not improve the coatings.

### Addition Agent Pump for Plating Baths

R. O. Hull & Co., Inc., Dept. MF,  
1306 Parsons Ct., Rocky River 16, O.

A practical and useful addition agent pump that provides small but constant rate of flow of any addition agent to any reasonably large plating tank is now made available by this firm.

The procedure of eliminating the personal element and providing a constant flow rate of addition agents is said to result in the greatest possible uniformity of plating together with the most economical use of addition agents.

The addition agent or Sigmamotor Proportioning Pump is self-priming. One pump operates one to four individual lines from the supply tanks to the plating tanks. Any liquid that does not affect rubber, neoprene or Tygon tubing (liquid does not contact anything but the tubing) can be pumped at any desired rate of flow from 12 ounces to 27 gallons per hour. Of course, addition agents may be diluted as necessary for proper flow rate. While highly useful for pumping bright zinc and bright nickel addition agents, etc., the addition agent pump can be handy when used to transfer acids or any other corrosive liquids.

### Lead-Clad Steel and Lead-Clad Copper

Knapp Mills, Inc., Dept. MF, 23-15  
Borden Ave., L. I. City, N. Y.

The first of two new clad metals offered by this firm is Ferrolum, which is made by inseparably bonding lead and steel in such a way that the finished product combines lead's unique immunity to sulphuric acid with steel's strength.

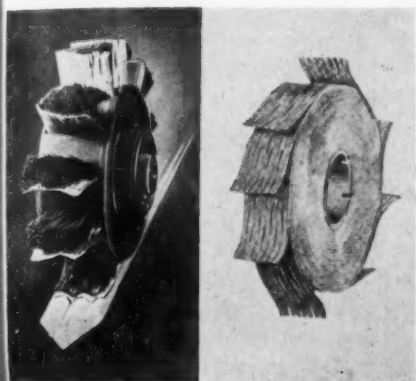
The second new metal is Cupralum, which is made by inseparably bonding lead and copper, retaining the best features of both metals, particularly

lead's acid resistance and copper's high electric conductivity and heat transfer value.

To bring to the attention of all those interested in full technical information on the latest developments in the use of lead and Ferrolum and Cupralum, Knapp Mills has available a 22-page illustrated booklet. Anyone interested in obtaining a free copy may do so by writing.

#### Scored Abrasives for Sand-O-Flex Contour Sanders

Merit Products, Inc., Dept. MF, 4023 Irving Pl., Culver City, Calif.



This firm is now supplying new "scored" abrasive re-fill cartridges for use in their popular line of Sand-O-Flex brush-backed contour sanders. To add greater flexibility to the already triple-flexed action, the abrasive cloth has been processed on machines built specifically for this purpose. The illustration on the right shows the cloth cut in staggered rows to give it pliability. The illustration on the left shows how the new abrasive gets down into grooves and recesses with a "paint brush" action.

Sand-O-Flex refill cartridges are made up of several strips of abrasive wound around a central core and are loaded in less than a minute. The strips unwind and are backed by brushes which "cushion" the abrasive forcing it over intricate shapes. Cartridges are available in garnet and aluminum oxide cloth in a wide range of grits. They are specially made for use in Sand-O-Flex wheels only. Years of experimentation with abrasives of all types has produced a superior sanding cloth for this type of heavy duty finishing. Scoring it has increased its efficiency especially on smaller, irregular parts, it is claimed.

## BETTER MUSIC

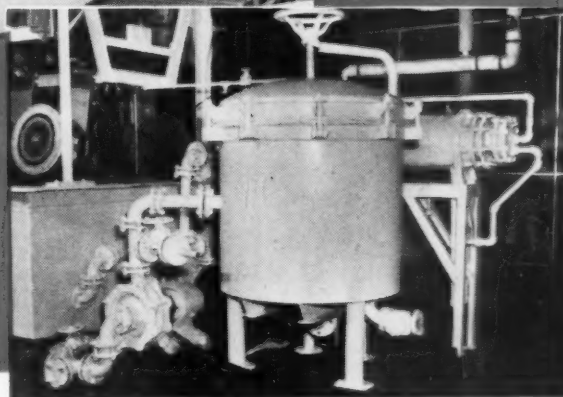
with an assist from

# SPARKLER FILTERS



High-speed copper plating equipment and Sparkler filter installed in RCA Victor plant at Canonsburg, Pa.

Close-up of Sparkler installation with heat exchanger behind filter and pump and motor at left of filter.



Sparkler filters installed in the Radio Corporation of America's phonograph record plants are one of the reasons why all RCA Victor recordings so faithfully reproduce the tone and quality of the original sound.

**Here's why:** One of the initial steps in this manufacturing process is the production of a large number of molding dies. The first die is made by electroforming an exact negative of the original soft lacquer recording; then, other electroforming operations produce the additional dies needed.

Since the smoothness of the grooved surfaces is one of the factors that determine the amount of noise produced by the record when played, and since any foreign particles in the plating solutions will introduce roughness into the electroformed parts, it is obvious

that extremely clean nickel and copper plating solutions must be obtained.

Sparkler handles this job easily, because the horizontal plate principle is especially designed to provide finest quality filtration under all types of operating conditions. Operators know that there is never any variation in quality with a Sparkler filter, even under fluctuating pressures or intermittent operation, since filter cakes are built up uniformly on horizontal plates. High flow rates, easy cleaning, complete portability, extremely low maintenance and operating costs, and minimum "down-time" — are other Sparkler features "tailor-made" for the plating industry.

Contact your Sparkler representative today, or write Mr. Eric Anderson for full information or engineering assistance.

**SPARKLER MANUFACTURING COMPANY, Mundelein, Illinois**  
Sparkler International Corp. Sparkler Western Hemisphere Corp.  
Herengracht 568, Amsterdam, Holland Mundelein, Ill., U.S.A.  
Manufacturers of fine filtration equipment for more than a quarter of a century

# Magnews

A Bulletin Issued Now and Then For Those Concerned With Industrial Cleaning And Related Problems

VOL. 8

GARWOOD, NEW JERSEY

NO. 1

## Why Many Metal Finishers Have Switched From Vapor Degreasers To The Magnus Emulso-Clean Process

Metal finishing shops using vapor degreasers in their cleaning set-ups have found that they offer a satisfactory method of cleaning when the contaminants are easily removable. However, when such substances as chalk, repair, chlorinated and sulphurated oils and other such substances, contaminants have to be removed, none and more finishing shops are discovering that the Magnus Emulso-Clean method is faster and more thorough in addition to being a money saver.

A metal finishing manufacturer, for example, recently switched to the Emulso-Clean process from a vapor degreaser and they report this method is costing them less than half of the former method. Another, a shop in Kansas, reports savings of \$100 per month over their former vapor degreaser. In both cases the cleaning results are superior with lower repair and rework costs.

During War II when distributed advertising became scarce, a large number of our present customers converted to Emulso-Clean with such resulting economies and improvements that the vapor degreasers were permanently discontinued.

Steel boxes before and after removal of drawing compound by Emulso-Clean Method.

## You Get Lasting Benefits with Metaffin

For many years Magnus Metaffin has been used for preventing sludge and carbon in gasoline, diesel and turbine engines of all types. With its specific METAL AFFINITY, it spreads on metal surfaces, forming a film which improves lubrication and protects metal against wear.

Metaffin also increases the capillary of oil. This keeps cylinder walls coated and saturated with oil when idle, and maintains an oil seal at the piston rings, making starting easy and protecting the cylinder walls while warming up.

Metaffin is also widely used for freeing stuck valves and its regular use keeps valves and bits clean and free-running.

In cleaning Metaffin with the number 10 solvent, it removes all sludge and carbon from the engine's interior. To be put on the regular mailing list, just send your name, title, company and plant address on your company letterhead.

**Ask Us to Send "MAGNEWS" Regularly**

Every issue of "MAGNEWS" carries new ideas in the cleaning and finishing of metal products that will be of practical value to you. To be put on the regular mailing list, just send your name, title, company and plant address on your company letterhead.



# MAGNUS

MAGNUS CHEMICAL CO. • 11 South Ave., Garwood, N. J.  
In Canada - Magnus Chemicals, Ltd., Montreal.  
Service representatives in principal cities.

### Industrial Clothing

**Worklon, Inc., Dept. MF, 253 W. 28th St., New York 1, N. Y.**

This firm manufactures a complete line of industrial work clothes designed to give maximum protection and wearing life. Made of DuPont "Orlon" material, these clothes feature acid resistance, easy laundering, and smart appearance. Orlon is one of the new miracle fibers which has outstanding resistance to a wide range of industrial chemicals and materials.

Their line includes coveralls for both men and women, laboratory coats, slack sets, women's caps, shirt and pants combinations, and service aprons. Write for your copy of their catalogue picturing and describing this line of modern work clothes.

### New Process for Coloring Aluminum

**Enthone, Inc., Dept. MF, 442 Elm St., New Haven, Conn.**

A new chemical process that in one operation permits the protection and coloring of aluminum in such colors as yellow, blue, green, gold, brass and many others is announced by the above firm.

This new process is called Alumox 44. The procedure for coloring consists of cleaning the aluminum part and then immersing it in a solution of Alumox 44 salts. Dyes can be added to the processing solution so that coating and dyeing occurs simultaneously. It is claimed that with this new process, aluminum objects can be dyed shades of brass and gold to resemble

these metals, a matter of particular importance in view of the shortage of copper base alloys. It is stated that Alumox 44 is equally effective on bulk work or large objects.

With Alumox 44 it is stated that clear coatings can be produced on aluminum to reduce finger marking and protect the aluminum against weathering. The coatings are relatively non-conductive and have a thickness of approximately 0.0001". The process is not meant to be a substitute for electroanodizing and was designed as a means of rapidly producing adherent beautiful colors on aluminum. In most cases, the finish is covered with clear lacquer. Almost all aluminum alloys can be processed successfully, including the wrought and the cast alloys.

The "Alumox 44" salts are available as a powdered material which is added to water in a concentration of 1 lb. gal. The bath operates in the temperature range from 190 to 210°F. Coloring is accomplished in from 15 seconds to 2 minutes. Dyes for the process are not sold by Enthone but a recommended list of dyes is given to the customer. Dyeing can be accomplished in two ways. One is simultaneous coating and dyeing, and the other procedure is to first coat and then dye.

Full information on processing and dyeing can be secured from the manufacturer by addressing requests to the above address.

### Liquid Blast Cleaning Machine

**R. W. Renton & Co., Dept. MF, 877 Addison Rd., Cleveland 3, O.**

A new wet blasting unit that can be used for cleaning, finishing, burring, blending, and etching is announced by the above firm. Designed for simplicity, the machine features no moving parts in contact with the abrasive mixture, hence no wearing out and expensive maintenance costs. The machine can handle an extremely wide range of abrasives, from 60 mesh to 5,000 mesh, and is claimed to produce finishes as fine as 1 micro-inch. A descriptive bulletin on this machine may be obtained by writing on company letterhead to the above address.

### Buffer Tablets

**Coleman Instruments, Inc., Dept. MF, 310 Madison St., Maywood, Ill.**

A new development of this firm is a line of buffering agents in tablet form, for easy makeup of solutions



for pH work in the laboratory. All that is required is to dissolve a tablet in 100 ml. of distilled water to obtain a solution of certified pH. Tablets are available for the range pH 2.0-12.0 in steps of .02pH. They are packed 12 to a vial, and are protected by a hermetic seal to insure good keeping qualities. Complete information on these handy tablets may be obtained by writing.

#### Carbon Steam Jets

*Heil Process Equipment Corp., Dept. MF, 12901 Elmwood Ave., Cleveland 11, O.*

This firm announces a line of steam heating jets made of Nocolodal, a form of graphitic carbon having all the inertness and resistance to corrosion typical of carbon. These jets can be used for heating or air agitating even the most corrosive of solutions, such as acid pickling baths for stainless steel containing hydrofluoric acid. The jets are constructed for easy connection to other piping, and can be used at steam pressures up to 50 p.s.i. Details are available in Bulletin 43.

#### Non-Etching Aluminum Cleaner

*Turco Products, Inc., Dept. MF, Terminal Annex 2649, Los Angeles 54, Calif.*

A non-foaming, non-corrosive, non-etching aluminum hot tank cleaner that is claimed to rinse quickly and completely with no tendency to bake on or leave a powdery residue is the newest addition to the family of Turco Products. Formulated to appeal to the aircraft industry, the new product is called "Aviation."

Advantage of the many benefits of agitation can now be taken with non-foaming Turco Aviation. Agitation of aluminum cleaners speeds production by removing the soil-saturated solution from the vicinity of the soiled metal. Furthermore, agitation exercises a vigorous mechanical scrubbing effect which aids in the removal of loosened soil. Aviation may be used advantageously with any means of obtaining vigorous circulation of the cleaning solution.

Aviation, which meets the corrosion requirements of MIL-C-5543, is said to quickly remove all types of foreign matter—even hard-to-remove etching-type marking ink. Especially designed for use on reactive metals such as aluminum, magnesium and their alloys, Aviation may also be used on



*Nuglu...*

#### IT'S

- FOR SETTING UP POLISHING WHEELS
- THE LEADER OF ALL GLUES
- THE ONE LIQUID COLD GLUE THAT ACTUALLY REDUCES POLISHING COST
- THE IDEAL ADHESIVE

J. J. *Siefen* CO.

**5643 LAUDERDALE • DETROIT 9, MICH.**  
**Nationwide polishing and buffing service**

many other metals. After dissolving quickly in hot water into a clear stable solution that will not sludge or salt out, Aviation cleans thoroughly and rapidly during a long tank life. It will not etch or darken even a highly polished aluminum, according to the firm.

#### Rigid Polyvinyl Chloride Fabrications

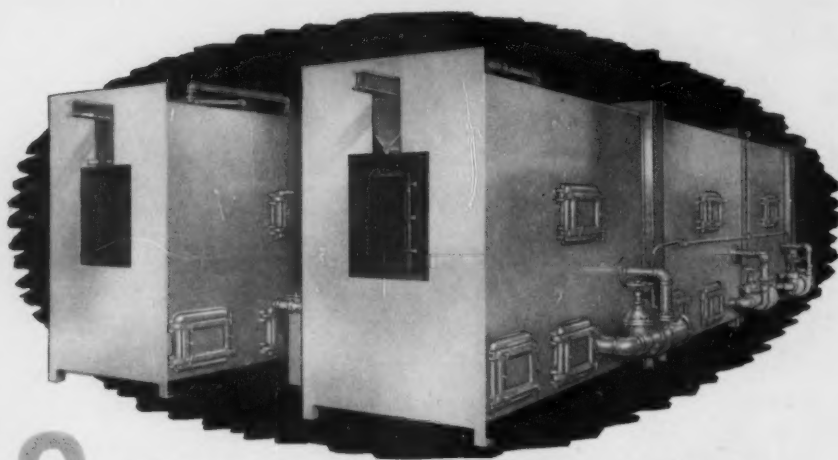
*American Agile Corp., Dept. MF, P.O. Box 168, Bedford, O.*

Agilide, a rigid polyvinyl chloride exhibiting exceptional resistance against water, acids, alkalies, salt solutions, vegetable and mineral oils, and many other corrosive media and offering very good physical properties, is

now fabricated through a combination of extrusion, molding, and plastic welding processes according to customer's specifications by the above firm.

Fabrications ranging from storage and chemical processing tanks and tank liners, pipe and duct lines, exhaust hoods and ventilators, to complete apparatus and equipment, previously made from high-grade steels and other expensive metals, are now available in Agilide, resulting in considerable savings due to greatly reduced maintenance and replacement costs.

Agilide is non-flammable and physiologically inert (odorless and tasteless), and the use of fabricated equipment and pipe lines is recommended



## 9 A-F Washing Machines Installed Because They Are **JOB ENGINEERED!**



You Can  
**SEE**  
The Superiority of  
**A-F**  
ENGINEERING

WHEN a large gear and forging plant wanted the fastest, most economical and efficient method of cleaning transmission housings and other metal parts, they decided upon A-F *job-engineered* Washing Machines. Two machines in their battery of nine are shown above.

Leading plants everywhere are using A-F Washing Machines because each machine is *engineered for a particular job!* Many factors enter into the efficient performance of metal parts or products washing machines — the size and shape of the parts or products, kind of metal, sequence of cleaning or other operations involved. Because these factors vary widely, no one type of machine can do all these jobs adequately!

You can be certain that an A-F *job-engineered* Washing Machine will handle your work efficiently. Don't be satisfied with less! Write for a discussion of your metal parts or products cleaning problems — today!

### THE ALVEY-FERGUSON COMPANY

200 Disney Street

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Cincinnati 9, Ohio

Offices or Representatives in Principal Cities—Coast to Coast



for applications where working temperatures do not exceed 170°F.

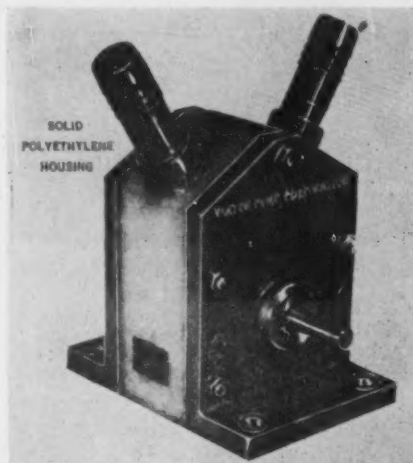
In addition to their many applications in the chemical industries, fabricated parts and assemblies made from Agilide are now used in many other fields, such as food-processing, aircraft and shipbuilding industries, etc.

### Non-Corrosive Chemical Pump

Vanton Pump Co., Dept. MF, Empire State Bldg., New York 1, N. Y.

This firm announces the newest addition to their line of corrosion-proof pumps for handling all kinds of corrosive solutions, the polyethylene pump in 10-20 g.p.m. sizes. Heretofore these pumps have only been available in smaller sizes, and the newest innovation should find wide use in

the plating and chemical industry. These pumps have no stuffing boxes, gaskets, or valves, and the liquid pumped never touches metal, hence



no corrosion or contamination. In the new line the body is made of polyethylene, so that the only materials contacted by the liquid being pumped is the housing and the flex-i-liner, which can be made of all types of natural and synthetic rubber.

Complete details and specifications are available on request to the above address.

### New Corrosion-Resistant Coating for Detrex Degreasers

Detrex Corp., Dept. MF, Detroit 32, Mich.

A tough, new material with superior corrosion-resistant properties has been developed and is now being used by Detrex for coating the inside of their standard line of VS-800, hand-operated, solvent-vapor degreasers.

This non-porous, phenolic type coating, which is called Detrex FF-1, is said to be exceptionally desirable from a stand-point of service life and maintenance. It is claimed to be remarkably impervious to any dissolving effect by trichlorethylene and perchlorethylene, and also strongly resistant to any chemical breakdown that might be caused by water-solvent mixtures, and relatively strong solutions of acids and alkalis and their vapors.

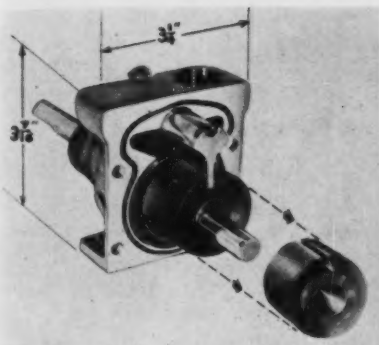
Machines coated with FF-1 have been production tested for several years under severe operating conditions without any sign of failure, showing service life comparable with that of machines fabricated from much more expensive nickel clad steel, according to the firm.

Should the coating be damaged by physical abuse during its service life, repair is simpler than in the case of metallized zinc coating. Also, as Detrex FF-1 is completely polymerized, is non-porous, and interlocks with the surface of the metal, any corrosion at a damaged area does not tend to spread beneath the adjacent coating, it is claimed. To repair FF-1, it is only necessary to abrade the damaged area with fine steel wool or emery paper, apply Detrex FF-1 by brush, and blend the coating by heating the patch with an alcohol torch.

### Teflon Impellers in Stainless Steel Pump

Eco Engineering Co., Dept. MF, 12 New York Ave., Newark 1, N. J.

Known as "Allchem," a new line of Eco chemical process pumps are



now available for prompt delivery, it is announced by the above firm.

As standard equipment, they have Teflon impellers, a Teflon-packed stuffing box, and a choice of Teflon or Graphitar self-lubricating bearings. Manufactured with stainless steel pump casings and shafts, these compact pumps are used for small volume process or laboratory work to pilot plant and industrial applications. They provide an all-around pumping unit that will operate in either direction in capacities from 1 to 20 GPM and pressures up to 40 p.s.i. with excellent lift, it is claimed.

Because Du Pont Teflon is chemically and biologically inert and is said to be entirely unaffected by any acid, organic solvent or alkali solution, the problem of choosing the right pump for a given job is greatly reduced. Eco Allchem pumps will convey virtually all fluid chemicals in the widest viscosity ranges.

Tough and resilient, the Teflon Impellers are not subject to thermo-shock nor to galvanic attack by pitting or erosion. They can be stored indefinitely, since they are not subject to shelf deterioration, it is claimed.

These Eco pumps are available in pump port sizes  $\frac{3}{8}$ ",  $\frac{1}{2}$ " and  $\frac{3}{4}$ " pipe tap, with Pulley-Drive base assembly, or base-mounted direct-connected with electric motors.

## LETTERS TO THE EDITOR

### CONTROL OF BRIGHT ZINC SOLUTIONS

Editor  
METAL FINISHING  
New York, N. Y.

Dear Sir;

We have noted in considerable detail the article *The Control of Bright Zinc Plating* by F. J. Kolar, Jr., published in the November issue. In this discussion we should like to take issue

with several of the author's conclusions and to point out some of the conclusions of over 14 years of experience with bright zinc plating.

First, the author proposes discarding of bath control by the total cyanide to zinc metal ratio. His chemical equations apparently show the existence of the compound  $\text{NaHZnO}_2$ , whereas a consideration of chemical principles would deny the existence of such an acid salt in a solution containing 10 to 15 oz./gal. of caustic soda. He apparently means sodium zincate,  $\text{Na}_2\text{ZnO}_2$ .

As to the consideration of the cyanide to zinc metal ratio, this was proposed long ago with the full knowledge of the existence of zinc in the form of both sodium zincate and sodi-

um zinc cyanide. However, it has proved to be a very practical means for bath control. Any other change at this time would only serve further to confuse the practical platers. The reasons are very simple for bath control of the primary components, i.e., zinc, cyanide and caustic soda by maintenance of caustic soda within definite limits and a definite ratio between cyanide and zinc. First, practical experience has shown the caustic soda content is not critical and may vary from 8 to 12 oz./gal. for a zinc content of 4.5 oz./gal. Second, the zinc metal content is quite difficult to control in the average shop because of the solution of zinc anodes when the bath is idle and frequently less than 100% anode efficiency when the bath is op-

# Wheels CUT FASTER, LAST LONGER

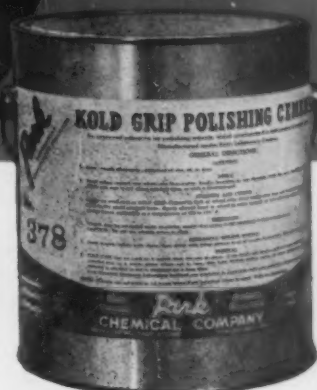


When treated with  
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POLISHING WHEEL CEMENT

**KOLD-GRIP** Polishing Wheel Cement, laboratory-controlled through every step of production, will arrive at your plant ready for use! Viscosity is constant, regardless of normal temperature variations and the cement can be applied directly from the container . . . without mixing or heating. Kold-Grip is clean, odorless and very easy to handle.

Coarse or fine-grain abrasives set up right for fast cutting efficiency. Substantial savings are effected through longer over-all wheel life, fewer setups and reduced wheel inventory.

Wheels dry rapidly, are unaffected by humidity changes, and may be stored in any convenient plant area.



Let our polishing engineer demonstrate Kold-Grip for you, or send for free sample, telling us the metal to be polished, grain sizes to be used, and drying facilities available. We can help you if we hear from you.



• Liquid and Solid Carbonizers • Cyanide, Neutral, and High Speed Steel Salts • Coke • Lead Pot Carbon • Charcoal • No Carb • Carbon Preventer • Quenching and Tempering Oils • Drawing Salts • Metal Cleaners • Kold-Grip Polishing Wheel Cement  
LICENSED MANUFACTURER: Lincoln Resinette France Co., Ltd., Wolverhampton, England



## IT'S A FACT...

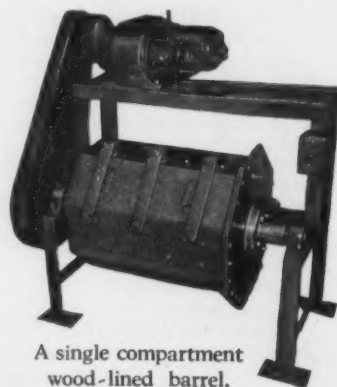
*"There's no single tumbling barrel — or one barrel speed — that will satisfy all types of tumbling requirements."*

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HENDERSON BROTHERS offers, from a wide range of tumbling equipment:

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erated. Third, for a constant caustic soda content the efficiency does vary widely with cyanide to zinc ratio. Fourth, the cyanide to zinc ratio is the critical factor in operating at different temperatures—a usually unavoidable point omitted by the author. Fifth, the caustic soda content is automatically raised as the zinc content rises, in the ratio of 1-2 oz./gal. rise in caustic soda for 1 oz./gal. rise in zinc metal content, a point also omitted by the author. Obviously, the cyanide content does not behave in such a favorable manner. In view of these, we would not consider any other control recommendations than the cyanide to zinc ratio and total caustic soda, all of which are subject to easy analysis and adjustment.

Regarding the use of addition agents, the best practical answer is that there would not be thousands of plating shops using the products of numerous suppliers if brighteners did not accomplish a useful purpose, especially since they are fairly expensive. The effects of addition agents in bright zinc are probably as profound as any electroplating addition agent in producing attractive deposits. Apart from appearance alone, we have observed zinc barrel baths that would not plate zinc over certain types of base metal in over an hour which upon the use of addition agent started to plate within 2 to 5 minutes, illustrating the effect of addition agents in elevation of the overvoltage of hydrogen on steel and permitting zinc to plate. This is not

true of all base metals but is true of many types of steel and alloys. In almost every case, the covering of zinc is initiated with the assistance of a suitable addition agent.

The author also points out the value of the passivating and brightening dips. These too are fairly expensive. Experience has shown that the use of brightening agents reduces the time of dipping (and hence removal of zinc, especially important in recesses) to the extent that they largely pay for themselves in minimizing plating time for the extra zinc dissolved and in conserving the dips. Additionally, better work is produced.

The author intimates that high purity methods of zinc plating are new. This is not the case, since the use of sodium sulfide and of high purity anodes was advocated in the very beginning of bright zinc plating 14 to 15 years ago.

It appears that the author is concerned with plating of zinc in a situation where (1) the base metal covers easily, (2) production is consistently the same, (3) operating conditions with respect to temperature remain constant, and (4) where brightness and appearance are immaterial. These conditions are in considerable contrast with the average production shop wherein variables are encountered daily, and appearance and brightness are important. Surprisingly enough, a good bright zinc plate retains its lustre several weeks or months, especially when bright dipped, unless exposed to adverse storage conditions. There is little doubt but that there will be a continuing demand for zinc addition agents.

The analytical control of sulfide appears desirable although empirical addition as required has proved satisfactory over many years. No doubt, statistical control is desirable in such plants as Western Electric and is a step forward.

We believe that the above discussion is necessary and desirable to clarify bright zinc plating in the minds of the many thousands of platers who have now had to convert to this type of finish which possesses real merit in itself."

R. O. HULL  
R. O. Hull & Co.,  
Rocky River, O.

Mr. Walter A. Raymond, Editor  
METAL FINISHING  
11 West 42nd St.  
New York 18, N. Y.  
Dear Walter:

In the November issue on page 78, the question of silver plating over nickel plate interested me from several angles. First there should be no reason for activating nickel plate deposits for silver plating. It is standard practice in the flatware and holloware industry to follow nickel plating directly with a silver strike, and then silver plate in the following sequence:

After nickel plating

1. water rinse—water rinse
2. cyanide dip
3. silver strike
4. silver plate

Second, if there is any reason for activating the nickel deposit directly after nickel plating, then the procedure should be as follows:

After nickel plating

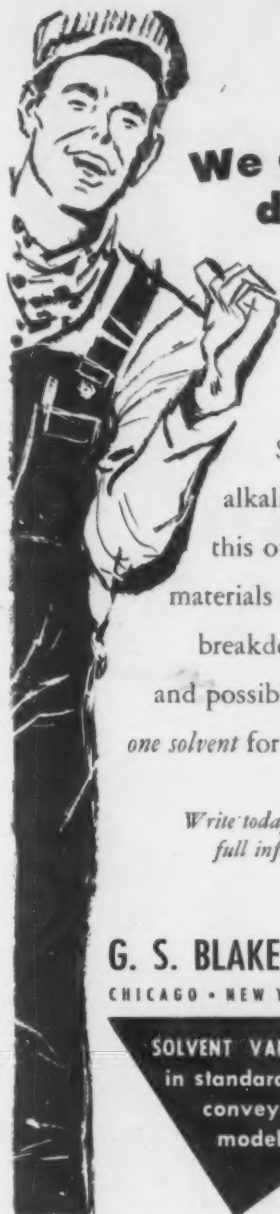
1. rinse in water
2. immerse in concentrated hydrochloric (muriatic) acid 1-2 seconds
3. water rinse—water rinse
4. cyanide dip
5. silver strike
6. silver plate

Third, if the silver plating does not immediately follow nickel plating, but the articles are heat treated for the removal of hydrogen embrittlement, or for any other reason, the procedure should be as follows:

1. cathodic clean
2. water rinse
3. water rinse
4. treat cathodically in 20% sulphuric acid with lead anodes @ 4 volts 2-3 minutes
5. water rinse
6. repeat 1-2-3
7. immerse in concentrated hydrochloric acid 1-2 seconds
8. water rinse—water rinse
9. cyanide dip
10. silver strike
11. silver plate

For detailed information of depositing nickel or other metals over nickel deposits, when such deposits do not immediately follow nickel plating, readers are referred to "The Re-Making of Surgical Instruments," Metal Industry p. 364—August 1919, and "The Adhesion of Electrodeposited Nickel to Nickel," Electrodepositors' Technical Society, p. 12—March 1937.

JOSEPH HAAS



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▲ Highest Stabilized Degreasing Solvent—BLACOSOLV is stabilized not alkalized—Years of research have produced this outstanding solvent. Contains no alkaline materials for the purpose of neutralizing acid after breakdown. Stabilizers prevent breakdown and possible acid formation. Blacosolv is the one solvent for all metals or combination of metals.

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**SOLVENT VAPOR DEGREASERS**  
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**NIAGARA-METAL PARTS WASHERS**—built to fit your needs

### NEW BOOK

#### Metallizing Handbook

Pub. by Metallizing Engineering Co., Inc. 38-14 30th St., Long Island City 1, N. Y. 250 pages. Price \$3.00.

This text, a completely new work, is profusely illustrated with photographs, diagrams and charts. It provides a comprehensive coverage of the technical as well as practical aspects of the process. Various methods of surface preparation and the application of metallized coatings for machine element work, for corrosion work, and for many special production jobs, are

thoroughly detailed along with valuable supplementary information.

This includes such miscellaneous applications as the repair of blow-holes in casting, brazing and soldering, glass and ceramics, mass coatings in tumbling barrels, electric circuits and model work, etc.

This comprehensive new handbook is the result of almost 20 years of experience in the design, manufacture and use of metallizing equipment.

### TECHNICAL LITERATURE

#### Ohio River Valley Pollution Report

What eight states are accomplishing

# It takes more than a



## ...to make a Refiner!

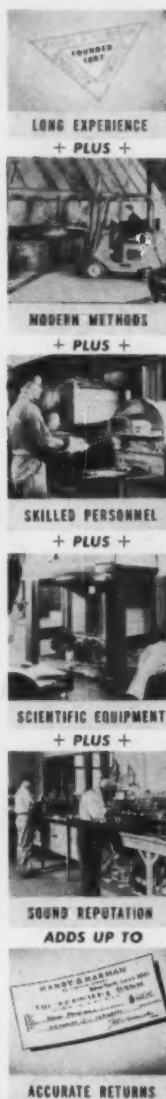
• Refining, in many respects, is like cooking. You'll agree a *real* cook can prepare a meal much better than one who doesn't have cooking "know-how" and experience.

It's the same with refining. It takes plenty of refining "know-how" and experience to recover every last bit of precious metal value from every lot of scrap and waste.

Through the years, our Research Laboratory has developed the right "recipes" — the scientific methods that assure the maximum recovery from each type of scrap and waste. And from these years of refining we have acquired a "know-how" that is your guarantee of an accurate, full value return from every lot, large or small.

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in their combined effort to combat stream pollution and preserve water resources in the Ohio River valley is told in the third annual report of the Ohio River Valley Water Sanitation Commission, which was released recently. The report was made to the governors of Illinois, Indiana, Kentucky, New York, Ohio, Pennsylvania, Virginia and West Virginia. These states are signatories to the interstate compact agency established in 1948 to promote a regional program of river clean-up.

The report details many elements of the Commission's program that were advanced during the year. These included:

... Adoption of legislation within the states to strengthen their own reg-

ulatory units to carry out the obligations imposed by the interstate compact agreement. For example, Ohio passed a new pollution abatement law; Illinois approved 23 bills revising its control statutes; and Kentucky put in operation a completely revamped control program.

... Issuance of a decision by the Supreme Court of the United States giving a complete stamp of approval to the pooling of police powers by the states for the regulation of waste discharges.

... Continued development of "industry-action" committees by means of which top management representatives of companies in the Ohio Valley are working with the Commission in promoting industrial waste control

measures. Five such groups — representing the steel producers, metal-finishing industries, distilleries, chemical salts industry and the bituminous coal producers — have been activated.

... Advancement of technical studies on the basis of which the Commission can formulate decisions for waste-treatment requirements. Completed were determinations on bacterial-quality limits, research on phenol treatment methods, an analysis of pollution patterns in the Ohio River and of chloride contamination in the Muskingum River. Of fundamental importance is the project initiated at the Kettering Laboratory of Applied Physiology in Cincinnati to determine toxicity potentials of substances discharged into public waters. At Lehigh University in Pennsylvania the Commission is sponsoring work to aid in development of methods of analysis for electroplating wastes.

Copies of the report may be obtained by addressing the Commission at 414 Walnut Street, Cincinnati 2, O.

### BUSINESS ITEMS

**Younger New General Manager for Standard Plating Rack**



**Harold E. Younger**

Mr. Harold E. Younger, formerly general superintendent of the Chicago Faucet Co., was recently appointed General Manager for the *Standard Plating Rack Co.*, of Chicago, Ill.

Mr. Younger enters the plating industry in the footsteps of his father, who was one of the original members of the Chicago Branch of the A.E.S. and who has been retired since 1945.



## Taylor Appointed Research Director for MacDermid

Dr. A. Lloyd Taylor has been appointed Director of Research in the research laboratories of *MacDermid Western, Inc.*, Ferndale, Mich., where he will work in the field of industrial detergents, chiefly for use in the field of metals. He was formerly Director of the Department of Chemistry of



Dr. A. L. Taylor

Pease Laboratories, New York; Director of Research for Oakite Products, Inc.; and Vice-President in charge of Research and Development for H. L. Shaw and Sons, Inc., Portsmouth, N.H. and Boston, Mass. More recently, he held the position of Research Supervisor for Wyandotte Chemicals Corp. Dr. Taylor is a member of the American Chemical Society and the American Institute of Chemists.

MacDermid Western, Inc., is a subsidiary of *MacDermid, Inc.*, of Waterbury, Conn., and will manufacture the complete line of MacDermid products for metal cleaning and electroplating.

## Lasalco, Inc. Appointed Promat Distributor

*Lasalco, Inc.*, 2828 LaSalle Street, St. Louis 4, Mo., has been appointed distributor for *Promat Div., Poor & Co.*, Waukegan, Illinois, manufacturers of chemicals for the electro-plating industry. The Promat line to be handled by Lasalco includes zinc, cadmium, copper and brass electrolytes and addition agents.

## Millard Leaves Arsenal to Join Automotive Rubber

Phillip Millard, native Detroit and U of D engineering graduate, has re-

## SAVE ON WHEELS... STEP UP PRODUCTION



Speeds from 1,500 to 3,000 RPM are instantly available with the turn of the dial while the lathe is in operation. Polishing and buffing (cut-color-satin) can be done on one machine with no delays or lost motion.

The Hammond VRO Variable Speed Polishing Lathe definitely will step up production and improve finish. Maximum wheel economy is assured, too, because efficient peripheral speed can be maintained at all times — wheels can be used right down to the flanges before discarding.

*Hammond*

VRO

VARIABLE SPEED

POLISHING

AND

BUFFING

LATHE



WRITE FOR CATALOG  
Catalog showing all Hammond polishing lathes, abrasive belt, "OD" and automatic finishing machinery gladly sent on request. Write today!



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signed as Materials Engineer at the Detroit Arsenal to join the sales engineering staff of *Automotive Rubber Co., Inc.*, Detroit, Mich.

Millard's background includes experience as rubber engineer with both Chrysler Corp. and Briggs Mfg. Co.

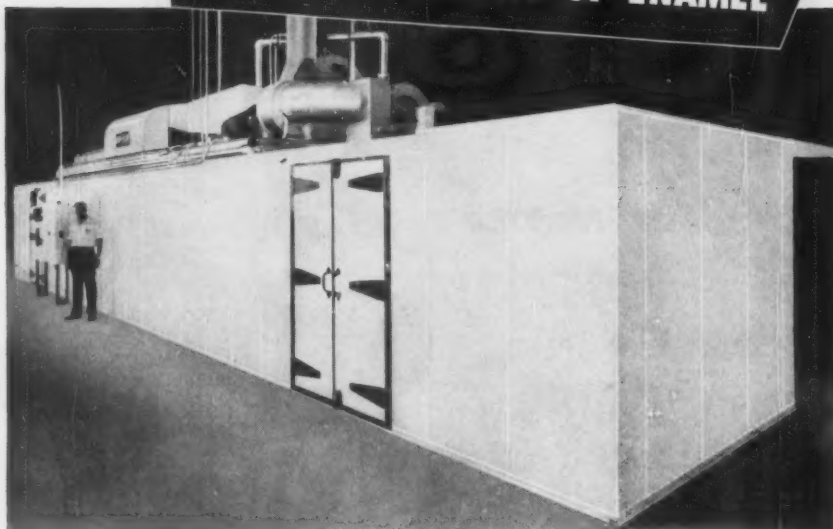
## Lea Opens Plant No. 2

About three years ago, *The Lea Manufacturing Co.*, Waterbury, Conn., located for many years in leased space at 16 Cherry Ave., in Waterbury, began its long-planned-for expansion program. It purchased a large plot with railroad siding on the west side of the city out toward Watertown. The first building, with some 10,000 feet of floor space, was laid out for stor-

age purposes, the company handling a large tonnage of resale items used in plating and finishing plants. Also, the new building furnished much better storage space for their own raw materials — abrasive, glues, tallow, etc. — needed in the manufacture of Lea Compound, Learok, Leabrasive and other Lea products sold all over the world.

Increased business kept crowding them at their old quarters at Cherry Ave., so that late in 1950, the company started the construction of the second unit in the project, a 22,000 square foot plant now in production, where the line of Lea Liquabrade Compositions; Copper, Cadmium and Nickel Brighteners, and the extensive line of

## KIRK & BLUM OVEN DRIES TWO COATS OF ENAMEL



... Money-Saving Oven Installation at Estate Heatrola Division Noma Electric Corporation Hamilton, Ohio

This conveyORIZED, moisture removal oven dries two ground coats of frit on stove parts. The oven is direct gas-fired and automatically controlled.

From the unload end, the material passes immediately to spray booths where the second ground coat is applied. The material has retained enough heat from the drying of the first coat to immediately

dry the second coat after spraying. To conserve floor space, heating equipment is mounted on top of the unit, together with recirculating and exhaust fans.

Whatever your need in ovens, for drying, dehydrating or baking, consult KIRK & BLUM. Ask for booklet on "Industrial Ovens".

### KIRK AND BLUM

INDUSTRIAL OVENS

The Kirk & Blum Mfg. Co.  
3159 Forrer Street  
Cincinnati 9, Ohio



Lea Plant No. 2.

Learok composition are being manufactured.

Three more buildings are projected: (1) additional storage space; (2) The Lea Compound plant; and (3) laboratory and office. No definite date has been set for their construction but it is hoped that the entire project can be completed by 1955.

#### Bernard Case Heads H-VW-M Research



Bernard C. Case

The Hanson-Van Winkle-Munning Co., of Matawan, N. J. announces the appointment of Mr. Bernard C. Case as Manager of Electrochemical Development. Mr. Case has transferred his activities to the Matawan laboratory from his position as field engineer at Detroit.

This move is designed to further strengthen and expand H-VW-M research and development activities in the electrochemical field. The completion of the outstanding new laboratory building in 1948 marked the start of this program.

Mr. Case brings exceptional qualifications to this new post. Recently honored for his work as Vice-Chairman of the Research Committee of the American Electroplaters' Society, Mr. Case was Associate Editor of *Plating* and has been active as Chairman of the Detroit Section of the Electrochemical Society, Chairman of Subcommittee 3 of B-8, A.S.T.M. and is an active member of the American Institute of Chemical Engineers.

#### Barker Bros. Adds Sales Executive

Announcement has been made by Barker Bros., Inc. of Brooklyn, N. Y.

of the promotion of Mark Reich to the position of Assistant Sales Manager. Mr. Reich heads sales and service in the New York area and supervises consumer sales nationally, thru direct representatives and agents.

Established in 1911, Barker Bros. manufactures and supplies buffing and polishing wheels for all finishing purposes. In addition to the regular buff line, Barker Bros. have been a pioneer



Mark Reich

in developing buffs for special purposes. Their present line is claimed to be one of the most comprehensive in the industry.

Mr. Reich has had 12 years experience in the metal finishing and production engineering field in addition to serving 4 years in the army.

#### New Wyandotte Product Demonstrated at Sales School

The Wyandotte Chemicals Co.'s industrial, railroad and aircraft sales and service supervisors witnessed a demonstration of the company's new phosphating cleaner during a week-long training school at the Wyandotte laboratories. Particular attention was given to the importance of assisting users of metal cleaners in setting up control procedures. Specific instructions for meeting the exacting metal processing specifications of defense contracts were also outlined.

Attending the school were, standing left to right—E. J. Kubis, Technical Service Department; W. S. Fernholz, Los Angeles; M. O. Crawford, San Francisco; B. Noel, Pittsburgh; Robert J. Racine, Manager Industrial Detergents; R. C. Gertson, Los Angeles; Terence Neill, Vancouver, B.C.; W. R. Christensen, Minneapolis; B. C.

*Mutual*

# CHROMIC ACID

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**SODIUM BICHROMATE**

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**MUTUAL  
CHEMICAL  
COMPANY  
OF  
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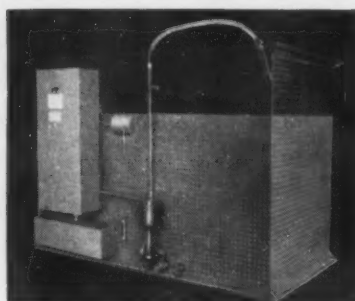
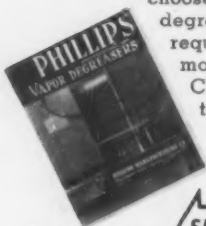
# PHILLIPS degreasers used by Air Force for removing Cosmoline

**DEGREASING  
EFFICIENCY  
PROVED IN  
WORLD WAR II**



Phillips Degreaser completely removes Cosmoline from four 20mm. guns in less than 4 minutes per gun.

**BACK** in the early days of World War II the government saw how important high speed removal of Cosmoline was to the war effort. The U. S. Air Forces' use of Phillips degreasers for handling one of the toughest metal cleaning jobs is proof that Phillips degreasers can and will help you increase production by solving your metal cleaning problems efficiently and economically. Out of the complete line you can choose a standard Phillips degreaser to meet most requirements. Special models built to order. Check with Phillips today!



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**MANUFACTURING COMPANY**  
Engineered Metal Cleaning Equipment

O'Keefe, Syracuse; Wallace Miller, Cleveland and Andrew Liger, head of Wyandotte Chemicals Industrial Laboratories.

Seated—A. S. Kiefer, Chicago; B. J. Rosenthal, Minneapolis; L. A. Dunn, Chicago; George Haas, Boston and J. W. Rapp, Special Railroad Representative.

## **Pennsalt Completes New Sales Division Reorganization**

The Pennsylvania Salt Mfg. Co. has completed steps in a new organization of its Sales Division, William P. Drake, Vice-President in Charge of Sales, announced today.

The new organization, toward which the company has been moving for the past two years, is designed to consoli-

date sales administration while retaining specialization essential to the company's diversified interests, and at the same time provide more emphasis on planning for current and future sales activities, Mr. Drake said.

The line organization of the Sales Division is headed by Russell S. Roeller as General Sales Manager. Mr. Roeller previously was an Assistant General Sales Manager, a position now eliminated. Reporting to him are Albert H. Clem as Field Sales Manager, Edwin S. Garverich as Manager of Technical Service, and the eight department sales managers.

Mr. Clem formerly was Sales Manager of the Industrial Chemicals Department. He will be responsible for all district sales offices and their man-

agers will report to him. Mr. Garverich formerly was Manager of Technical Service on Specialties.

The planning organization for the Sales Division is headed by Arthur C. Tunstall, Jr., as Manager of Marketing. Mr. Tunstall also was previously an Assistant General Sales Manager. Reporting to him are Paul C. Hurley, Manager of Sales Promotion; Franklin A. Lucard, heading the new department of Sales Development, and Malcolm J. Harkins in the new position of Manager of Sales Control.

In line with the new organization, Mr. Drake also announced several changes in the managements of sales departments. George D. Grogan, formerly an Assistant to the Vice-President in Charge of Sales, was named Sales Manager for Industrial Chemicals, replacing Mr. Clem.

Joseph J. Duffy, Jr., was named Sales Manager of the Fos Products and Industrial Cleaners Department, a new department formed from consolidation of the former Fos Products Department and Special Chemicals Department.

Robert R. Pierce was appointed Sales Manager of the newly-formed Corrosion Engineering Products Department. He was formerly a Products Supervisor on Pennsalt's corrosion resistant cements and paints, which were marketed by the Industrial Chemicals Department.

Edward M. Wilson, formerly an Assistant to the Vice-President in Charge of Sales, was appointed Manager of the Government Sales Department. This department was previously in existence but was administered by Mr. Drake and Mr. Wilson jointly.

Retaining their present positions under the new organization are J. Stanley Hall, Manager of the Laundry and Dry Cleaning Department; S. H. Crounse, Manager of the Food Industry (B-K) Department; H. A. Fletcher, Manager of the Household Products Department; Arthur F. Bixby, Manager of the Agricultural Chemicals Department, and H. F. McIntyre, Manager of the Maintenance Chemicals Department.

As a preceding step leading up to the new organization, Pennsalt earlier this year consolidated all its district sales offices and set up several new ones. In these offices all salesmen, while remaining as specialists in their various fields, will report to the district sales manager.

## New Alkali Plant Opens in Colombia, S. A.

Sometime in January a huge new alkali-producing plant will start operations in Bogota, Colombia, South America. The plant was built for the national industrialization program of that country by the H. K. Ferguson Co., and is expected to have an output of 36,500 metric tons of Soda Ash, from which can be produced caustic soda and bicarbonate.

## Precision Shot Co. Expands

The Precision Shot Co., Birmingham, Mich., manufacturers of Cutwire Shot, have completed expansion of facilities for their new Shot Peening Division. This division operates for industry as a pilot and contract production shot peening shop, and offers experimental facilities and consultation service to firms wishing to investigate the shot peening process.

## New Buff Distributor Appointed

The United Buff Products Corp., of Passaic, N. J., exclusive manufacturers of the pressure-cooled "Airflow" buff announces the appointment of Mr. Arthur M. Rothschild, Industrial Machinery, Inc. 501 No. Cortez St., New Orleans 19, La., as their new distributor. This distributorship will cover Louisiana and Mississippi.

## Detrex Appoints Omaha Bakers Supply Co.

The Omaha Bakers Supply Co., 1317 Leavenworth St., Omaha 8, Neb., has been appointed by the Detrex Corporation, Detroit 32, Mich., distributor of their line of specialized pan cleaning chemicals and equipment.

Detrex points out that the Omaha Bakers Supply Co. and their manager, Henry Hansen, have had many years experience in all phases of sales and customer service. They will handle the distribution of all Detrex equipment and chemicals in the Omaha and West Central areas.

## Henry & Miller Co. Opens N. J. Plant

Kippling R. Henry, president of Henry & Miller Industries, Inc., announced the recent opening of a new metal fabrication and finishing plant in Jersey City, N. J. The plant, which began production in October, will be in full-scale operation early in January with about 150 employees.

Henry & Miller, a ten year old firm

# COATING THAT HELPED SPEED UP PLATING

## Properties of UNICHROME COATING 218X

*pay off once again — reducing hard chromium plating time*

● A steel company, when hard chromium plating the rolls used in its mill, made an important saving with Coating 218X. By baking this green plastisol insulation onto the roll-holding racks, a substantial increase in plating speed was made possible. Ability of Coating 218X to maintain tough, unbroken protection slashed the current formerly lost by chromium depositing on the racks.

Tough yet flexible, Coating 218X can take use and abuse without cracking or tearing, without forming pockets or blisters. It has superior resistance to chemicals and requires just one prime coat for unsurpassed adhesion in all plating cycles — vapor degreasing included. Result: Longer-lasting, therefore more economical, insulation.

United Chromium's service engineers can give you helpful tips on better rack protection. Call them in. Or write us for names of nearby authorized appliers of Unichrome Coating 218X.



## Products of UNITED CHROMIUM, INCORPORATED

100 East 42nd St., New York 17, N. Y. • Detroit 20, Mich. • Waterbury 20, Conn. • Chicago 4, Ill.  
Los Angeles 13, Calif. • In Canada: United Chromium Limited, Toronto, Ont.

with two other plants in New York and one in Canada, manufactures machine tool, radar and television parts, bomb fuses, and numerous other precision items as well as anodizing and plating for military use.

The new plant is a 40,000 square foot structure with overhead traveling cranes and three loading platforms. The firm selected the Jersey City site because of its proximity to the company's central engineering, drafting and development offices in New York City, and because it offers excellent rail, water and highway transportation facilities. Jersey City also offers a highly skilled labor market, a vital factor in precision operations that call for tolerances as close as .0001 of an inch.

When completely tooled, Mr. Henry said, the new plant will offer a complete metal fabrication, finishing and packing service to customers.

Among the firm's customers are the Federal Government, General Electric Company, Radio Corporation of America, Sperry Gyroscope, and Westinghouse Electric Co.

## Oakite Service Representatives Hold Annual Technical-Sales Conference

Field service representatives from the Cleveland, New England, New York and Philadelphia sales divisions of Oakite Products, Inc., manufacturers of specialized cleaning materials, are shown gathered for a series of technical-sales conferences at the Hotel Statler in New York City on

# STOP OFF

## FOR ALUMINUM

A new Stop Off lacquer for use on Aluminum in selective anodizing, or in chemical treatments of this metal.

BUNATOL No. 796-CC Black is a quick air dry liquid that flows out easy and covers well. Air dries in 30 minutes to form a very adherent coating that is not affected by anodizing solutions or chemical solutions. Edges may be trimmed to a hair line, or lettering or designs may be exposed, and hold the edge perfectly. Applied by brush, spray or dip.

A single coat is all that is required for a good Stop Off film. This special lacquer covers a lot of surface, making it an inexpensive item to use in production. After running, the coating removes easily with a quick wash in Solvent. The Aluminum does not need any preliminary treatment other than removing surface dirt and grease, and must be dry. Just apply Stop Off, air dry and run the work.

No. 796-CC Black is made for use on Aluminum and of course does a better job. Time is saved — rejects eliminated and cost reduced. If your anodizing requires stopping off, get the facts about BUNATOL and a working sample. A note on your letterhead is all that is necessary.

**BUNATOL**  
Manufactured by  
**NELSON J. QUINN COMPANY**  
TOLEDO 7, OHIO

November 29-30 and December 1. Featured subject of discussion at these meetings was the major role that cleaning and allied procedures must play in helping industry meet increased defense and civilian production requirements. Also heard were reports from

Oakite research chemists, service engineers and technicians on new developments in cleaning and related materials soon to be made available to industry. Similar conferences held in San Francisco and Chicago during November were attended by represen-



tatives from the Company's North Pacific Coast, South Pacific Coast, Midwestern and St. Louis divisions, and from its Southern, Southwestern, Chicago, Detroit and Milwaukee sales territories respectively.

### Zinn Named Plating's "Man of The Year"



Carl Hansen of Advance Tinning Co., Chicago presents to Wilbur O. Zinn, president of National Plating Co., Chicago an engraved plaque honoring Mr. Zinn as "Electroplating's Man of the Year" at the Chicago Electroplaters Institute dinner meeting in the Electric Club of Chicago on Oct. 18.

A stocky man with bristling black hair stepped up to the speaker's rostrum. He blushed, rubbed his stubby chin and accepted the honor of becoming "Electroplating's Man of the Year" of the Chicago Electroplaters Institute.

That man, *Wilbur O. Zinn*, president of the National Plating Co. of Chicago, was deserving of the CEPI honor bestowed upon him on Oct. 18 at the Electric Club of Chicago.

Zinn, a young man of 41, has been president of National Plating since 1945. He is a former president and now serves as a director of the *National Association of Metal Finishers* and has been active in the NAME since 1946.

He was instrumental in securing government and defense program recognition for more than 2,000 member companies in his group. He has been a tireless worker in the CEPI since joining the organization.

Zinn is a resident of Lombard, Ill. and is active in many civic activities. He is a member of the Lombard Information committee, Lombard Junior Recreational committee, and assistant cubmaster of the Lombard Cub Scouts.

Beside all the electroplating activities in and out of his company, he has had time to rear a family of three boys.

### Free Course in Electroplating

The Spring term for the course in



Electroplating at the *Brooklyn Evening Technical High School*, 29 Fort Greene Place, Brooklyn, N. Y., will begin on February 1, 1952.

The course includes a review of elementary chemistry, calculations for the preparation of standard solutions, specific gravity, neutralization, pH, hydrolysis, and similar related topics. Laboratory experiments will cover analyses of copper, nickel, chromium, and silver baths; chemical and physical tests of electrodeposits, Ohms law, and current efficiency.

Registration for the course begins the week of January 28, from 7:00 P.M. to 9:00 P.M. Classes meet from 6:45 P.M. to 8:15 P.M. Inquire in Room 1W2. This course is limited to men in the electroplating industry.

#### Divine Appoints Harry Fish Purchasing Agent

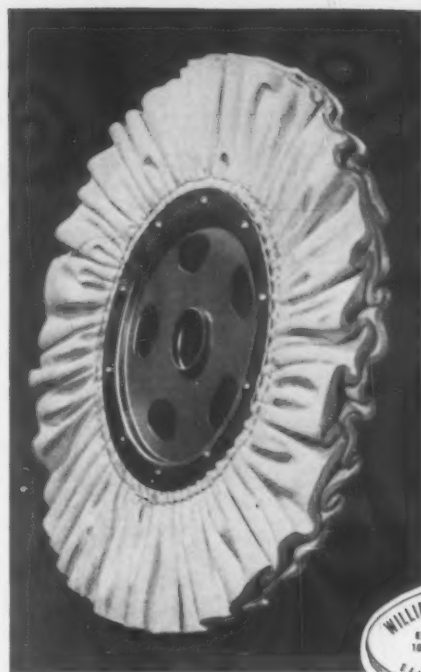


Harry Fish

Announcement has been made of the appointment of *Harry W. Fish, Jr.*, as Purchasing Agent of *Divine Brothers Co.*, Utica, N. Y., manufacturers of buffing and polishing wheels, accessories and machinery, and casters and wheels for materials handling applications. Mr. Fish also will handle purchasing details for the *Munson Mill Machinery Co.*, Utica, a subsidiary of *Divine Brothers Co.*

He became associated with *Divine* in 1933, and served in various capacities in the Metal Finishing Sales Department and the Order & Billing Department.

In 1949 he was appointed Manager of the Customer Service Department, and Supervisor of the Order & Billing Department, which positions he held until his appointment to the Purchasing Agent's post.



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Cut on the bias for long, rugged service  
Steel center is perforated for cool running  
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Let us rush you full details of how  
the new CUTMASTER can cut your automatic  
buffing cost now — write, wire or phone!

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The Bullard Clark Company

DANIELSON, CONNECTICUT

#### Duggan Adds New Plant Facilities

*Duggan Masking Devices*, Detroit 16, Mich., announces the opening of a new addition to its plant at 2030

West Fort Street. This will increase the company's manufacturing floor space by almost 4,000 square feet.

The company is heavily engrossed in defense production at this time and



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for a Sparkling Finish



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After tumbling with an ordinary compound, these kids' bicycle bells came out a dull lifeless gray. Substituting Du-Lite's #3 Burnishing Compound completely removed the gray soapy film, and gave the bells a bright mirror finish at a substantial saving of compound per month.

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Du-Lite's service to industry is complete from research on specific metal finishing problems to installation of processing equipment. Du-Lite's line includes cleaners, strippers, blacking agents, wetting agents, passivating agents, rust preventatives, burnishing compounds etc. for any type of metal.

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Rush information on your products for finishing following metals:

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Company.....

Address.....

City..... Zone..... State.....



the additional facilities are needed to maintain required delivery schedules on plating racks and masks for their regular civilian customers as well as the production masking devices for ordnance material.

**New Chicago Plating Firm**

Formation of a new plating firm in Chicago to be known as *Metro Electro Processing Corp.*, was announced today by *Gus G. Sutter*, newly elected president.

Other officers of the new firm are *Tom W. Graff*, vice-president and *Sam Yokely* as secretary-treasurer.

Mr. Sutter is also president of the *Pioneer Plating Co.* and has been associated with the plating business for the past 10 years.

Mr. Yokely was a former partner in the firm of *Clybourn Polishing Co.* for six years.

*Metro Electro Processing* will be the exclusive licensee in the Midwest area of a new process known as "Electro-film Process," of California.

This new process is a dry lubricant. It is used for moving machinery parts in all industries.

**Pyrene Names Eckelmann Vice-President**

*Luis E. Eckelmann*, manager of the *Metal Finishing Div.*, has been elected vice-president of the *Pyrene Manufacturing Co.*, Newark, N. J. He will be in general charge of development work as well as of metal finishing.

In April 1916 Mr. Eckelmann, while still a student at the *Polytechnic Institute of Brooklyn*, New York, joined *Pyrene* to do part time research, and following his graduation in June of that year, he became a full time member of the staff.

Mr. Eckelmann is recognized nationally as an expert in electro-chemical problems, and under his guidance the *Metal Finishing Div.* has established a reputation second to none in its highly specialized field.

**New Wisconsin Plating Corporation**

*Art Plating Corp.* has been incorporated in *Appleton, Wis.*, with a capital stock of 1,250 shares of common, to conduct the business of plating, etc. Incorporators are *Clyde N. Sheperdson* and *James Watson*, the latter being the registered agent for the corporation. Registered office is at 1320 N. Meade St., *Appleton, Wis.*

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**ANODE BAGS**

For Strong Acid Solutions,  
Acid Copper, Acid Zinc,  
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24" Anodes . . . . .	\$0.82 each
30" Anodes . . . . .	\$ .94 each
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**ANODE BAGS**

For Alkaline and Nickel  
Solutions

Cyanide Copper	Brite Copper
Cyanide Zinc	Brite Zinc
Watt Nickel	Brite Nickels
Silver	Tin
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**Bags for Standard Elliptic**

24" Anodes . . . . .	63c each
30" Anodes . . . . .	72c each
36" Anodes . . . . .	80c each
40" Anodes . . . . .	88c each

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- ☆ **TEAR RESISTANT**  
3 to 4 times tensile strength and elasticity of cotton
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continuous service up to 300° F.
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- ☆ **NON ABSORBENT**
- ☆ **CHEMICALLY RESISTANT**  
Unaffected by alkalis

Prompt shipment on standard and special sizes.  
Write today for prices and detailed information.

**Bags for Scrap Anode Baskets**  
JOBBER INQUIRIES SOLICITED.



## Reinken Heads Rectifier Section of NEMA

L. W. Reinken, Chief Engineer of W. Green Electric Co., Inc., was elected chairman of the Metallic Rectifier Section of National Electrical Manufacturers Association at a recent meeting in Cleveland. This Section of NEMA develops technical standards and authorized engineering information on selenium and copper oxide stacks, and on electroplating rectifiers and industrial truck battery chargers.

At the same meeting Julian Loebenstein, of Radio Receptor Co., Inc., was elected vice-chairman of the Section for the coming year.

## Automotive Rubber Co. Expands With Addition of Texas Plant

Acquisition of the former Texas Tank Co. Plant in Houston, Texas is announced by Tim G. Meulenberg and Robert L. Redmond, co-founders and owners of Automotive Rubber Co., Inc., Detroit, Mich.

In making the announcement they state that plans had been completed for operating the plant as Arco Rubber Processors, a division of Automotive Rubber Company, Inc. Structural alterations and installation of special rubber processing equipment will start immediately, under the direction of a group of operation men from the Detroit plant.

The new Houston operation, like the Detroit plant, will specialize in engineering, manufacture and installation of rubber insulated tanks of all kinds, tank cars, exhaust systems, pipe and other production and plant equipment, as well as mechanical rubber parts. Chemical, aircraft, automotive and machine tools are the principal industries served.

## Pennsalt of Washington Opens Industrial Cleaners Plant

The Pennsylvania Salt Mfg. Co. of Washington has completed construction and begun operations of its new plant here for production of industrial cleaners, believed to be the first basic producer of its kind on the West Coast.

The new plant will manufacture a complete line of specialty metal cleaners for a variety of metal-finishing operations, including electroplating, enameling, painting, galvanizing, fabrication and assembly, aluminum anodizing and etching, as well as cleaners

THE WIRE COATING & MANUFACTURING CO.  
395 East 131st Street  
Cleveland 8, Ohio

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| 1 WCM Brite Copper           | 2 WCM Wetting Agent 1535 |
| 3 WCM Zinc Brightener        | 4 WCM Zinc Purifier      |
| 5 WCM After Zinc Bright Dips | 6 WCM Neutralizer        |
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### Addition Agents

Of functional or decorative use in both defense and civilian production. Commercially proven to yield highest quality at minimum cost.

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## COMING EVENTS OF THE A. E. S.

### Chicago Branch

Annual Educational Session and Banquet

January 26

Conrad Hilton Hotel

Chicago, Ill.

### New York Branch

Annual Educational Session and Banquet

February 16

Statler Hotel

New York, N. Y.

### Dayton Branch

Annual Educational Session and Banquet

March 15

Biltmore Hotel

Dayton, Ohio

### Boston Branch

Annual Educational Session and Banquet

April 19

Statler Hotel

Boston, Mass.





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LESS SCRAP LESS REJECTS

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Here are the scientific principles, practical methods, up-to-date formulas, processes and suggestions that will be invaluable to everyone concerned with electroplating and electrotyping. The most efficient modern methods of putting electrodeposits on more than 40 different metals, alloys and plastics are summarized completely in this thoroughly revised and enlarged book. You also get simple explanations of principles of electrochemistry and physics that underlie plating processes, and of recent developments in electrodeposition procedures and products.

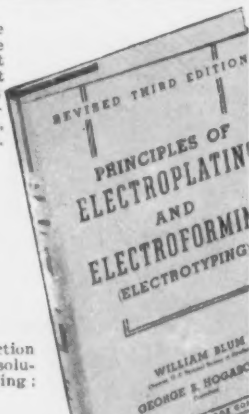
### PRINCIPLES OF ELECTROPLATING AND ELECTROFORMING

By WILLIAM BLUM  
Chemist, U. S. Bureau of Standards  
and GEORGE HOGABOOM  
Consultant

This text gives a thorough treatment of such basic topics as—protection against tarnish, corrosion, wear; qualitative, quantitative analyses of solutions; pickling, dipping; electropolishing; electroforming; electrotyping; reproducing phonograph record matrices, manufacturing tubes, etc.

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Revised 1949 Edition  
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for the transportation, industrial and general maintenance fields.

Formerly Pennsalt has supplied its users in this area from its works at Wyandotte, Mich.

In announcing the opening of the new plant, Fred C. Shanahan, president of Pennsalt of Washington, pointed out that its location will result in timesaving on deliveries and more efficient service generally on these products.

The new plant embodies the latest production techniques and equipment. Improvements include accurate quality control devices, packaging and handling equipment and the usual equipment for comfort and safety of production employees.

The industrial cleaner products plant is part of Pennsalt of Washington's continuing long-range program for the expansion and addition of basic chemicals and chemical specialties for use in agriculture, metal working, pulp and paper, dairy production, food processing, laundry and other industrial uses in the West.

The cleaner specialties produced at Portland will be distributed through Pennsalt's district offices located in Los Angeles, Berkeley, Portland and Tacoma.

The sales-service organization for the industrial cleaners manufactured and distributed by Pennsalt of Washington is under the supervision of William J. F. Francis, Sales Manager of Pennsalt's Western Specialty Chemicals Div., and headed by Richard A. Snyder at the Los Angeles office, as District Sales Manager, Industrial Cleaner Div.

### Taormina to Head New York Job Platers Group

Mr. S. C. Taormina, metal finishing consultant, of New York City, was recently elected Executive Secretary of the Masters Electroplating Associa-



tion, to succeed the late Adolph Bregman.

Mr. Taormina is a graduate of Brooklyn Polytechnic Institute, and operates Platers Technical Service, Inc., a consulting firm with offices and laboratories in New York and Chicago. The new offices of the Masters Electroplating Association will be at 50 East 4th Street, New York 3, N. Y.

## Manufacturers' Literature

### Cleaning and Conditioning Metal

Klem Chemical's, Inc., Dept. MF, 14401 Lanson Ave., Dearborn, Mich.

This firm announces the publication of literature on a new metal conditioning process.

Klem Kote is the newest development in the field of metal cleaning, preparation and rust-proofing. Used in a three-stage washer system it gives paint adhesion and salt spray resistance equal to five and six stage rust-proofing systems, it is claimed. It imparts a fine iridescent, crystalline, tightly adherent, complex phosphate coating to the metal surface.

Literature may be obtained by addressing Klem Chemicals, at the above address.

### Degreaser Operation Manual

Manufacturers Processing Co., Dept. MF, P.O. Box 6, Detroit 20, Mich.

This new booklet recently issued by the above firm gives the Do's and Don't of vapor degreasing for insuring economy, safety, and efficiency of the

# DAVIS-K

## GOLD and RHODIUM PLATING SOLUTIONS HEADQUARTERS

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- Made in All Colors
- Colors Constant
- Brilliant Finish
- Tarnish Resistant
- Settled By Troy Weight
- Made From U. S. Treasury Gold
- Ready For Immediate Use



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DAVIS-K—makers of GOLD PLATING SOLUTIONS—prepared in all colors that produce hard, tarnish-resistant, color constant deposits. Solutions remain clear, thus eliminating excessive filtration. Compounded from U. S. Treasury GOLD and highest (C.P.) chemicals. Sold by troy weight—certified 100% gold content. Solutions are simple to operate and maintain.

ANTIQUE SOLUTIONS—Deposit gold and antique in one operation—produce uniform finish—simple to operate. Your samples plated at no charge.

We welcome inquiries pertaining to precious metal plating problems. Distributors of Bakers' lustrous RHODIUM SOLUTIONS, that produce a long-lasting white finish.

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operation and equipment. The booklet is cleverly illustrated with cartoons and sketches illustrating the rights and wrong ways of performing each step, including maintenance of the machine.

For training new operators, or refreshing the older, experienced operators, this booklet is an ideal presentation of the principles of good vapor degreasing practice.

Copies may be obtained by writing to the above address on your company letterhead.

#### Industrial Waxes for Metals

*S. C. Johnson & Son, Inc., Dept. MF, Racine, Wisc.*

An illustrated booklet is available from the above firm which describes their line of industrial waxes useful for a wide range of industrial protective functions, as well as for between-process protection and lubrication. Some of the uses for which these waxes have found application include lubrication for deep drawing and cold heading, threading, and bending. Special wax mixtures can also be used as effective coolants in metal cutting operations. A number of application

methods are possible, depending on the shape of the parts and the production requirements.

Write for your copy of this helpful booklet.

#### Corrosion-Resistant Equipment

*U. S. Stoneware Co., Dept. MF, Akron 9, O.*

A new catalogue issued by this firm illustrates and describes their line of tubing, gaskets, protective coatings, lining materials, chemical stoneware, and acid resistant cements for the plating and allied industries. Properties and suggested applications are featured. Send for your copy of Bulletin M to the above address.

#### Barrel Finishing and Deburring

*Grav-i-Flo Corp., Dept. MF, 400 Norwood Ave., Sturgis, Mich.*

This firm has published a new catalogue giving full particulars on their line of barrel finishing equipment and materials. Grav-i-flo machines are designed with high production finishing in mind, and incorporate the features that make barrel finishing in their equipment economical and efficient. In

addition to the barrels themselves, this catalogue describes and illustrates the bins, pans, hoists, and other auxiliary equipment needed for a completely modern barrel finishing department.

Copies of this catalogue may be obtained by writing to the above address.

#### Metal Finishing Supplies

*Davies Supply & Mfg. Co., Dept. MF, 301 N. Market St., Dallas 1, Texas.*

A bulletin issued by this firm describes their complete line of metal finishing supplies and equipment for the Southwestern United States. This firm acts as jobbers and representatives of many of the nation's leading equipment manufacturers, and carries everything needed for metal finishing work, from Abrasive grains to Zinc plating solutions. Copies of the bulletin are available by writing.

#### Production Line Testing Equipment

*General Electric Co., Dept. MF, Schenectady 5, N. Y.*

A new 80-page catalog summarizing for the first time under one cover all of the General Electric Co.'s testing

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**TRUE INSULATORS** are the first insulators for coils in plating tanks designed especially for the electroplating industry. Available in popular sizes for immediate delivery.

Write for technical bulletins

### TRUE BRITE CHEMICAL PRODUCTS CO.

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Practical Products for Practical People



and measuring equipment for laboratory and production line use, has been announced as available.

To be used primarily as a reference to the apparatus available for the complex measurements to be made in industry, the new catalog (GEC-1016) contains more than 150 photographs and diagrams and describes the uses, features, specifications and prices of more than 130 G-E testing and measuring equipments. The new catalog also contains publication references to G-E bulletins that describe each device in more detail.

#### Purifier for Chrome Baths

Illinois Water Treatment Co., Dept. MF, 900 Cedar St., Rockford, Ill.

A bulletin issued by this firm illustrates their Illco-Way chrome purifier which can be used to purify and recover chromic acid from spent chrome plating baths and anodizing solutions by ion exchange methods. It is also useful for eliminating chromic acid from rinse waters and thus eliminating a waste disposal problem. Various sizes of these units are available for handling any quantity of chrome solution on a regular regenerating

schedule. Write to the above address for a copy of this bulletin.

#### Metal Pickling Baskets

Hoffman Co., Dept. MF, 41-43 N. Penn St., York, Pa.

A catalog and price sheet has been published by the above firm covering their line of pickling and handling baskets for small parts, dryer baskets, wire trays, strainers, and special wire containers. All types of corrosion resistant alloys are used in making these items, and the firm is set up to render engineering advice for special problems without any obligation. Copies of the bulletin showing the basic standard types, with prices, may be obtained by writing to the above address.

#### Practical Surface Tension for Platers

Joseph B. Kushner Electroplating School, Dept. MF, 115 Broad St., Stroudsburg, Pa.

A booklet recently published by the above institution explains in simple language what is meant by surface tension and its importance in the plating field. It also discusses surface active agents, pointing out what they

can accomplish in producing better plated goods, and the problems accompanying their use in cleaning, pickling, and plating baths. Methods of control are also described in detail.

Copies of this bulletin will be sent on request, giving title and firm name.

#### Bufs, Wheels, Compounds Catalogue

Beacon Supply Co., Dept. MF, 110 Marginal St., Chelsea, Mass.

A new catalogue of the above firm illustrates their line of felt wheels and bobs, Walrus wheels and bobs, bull-neck leather polishing wheels, folded buffs, sewed buffs, polishing and buffing compositions. Write to the above address for your copy of this helpful booklet.

#### Manufacturers, Shippers Offered Use Chart on Rust Preventive Compounds

Nox-Rust Chem. Corp., Dept. MF, 2429 S. Halsted St., Chicago 8, Ill.

A new Rust-Preventive Use Chart No. 1151, for manufacturers and shippers of metal products, has been prepared by the above firm.

This chart lists the latest U. S. gov-



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ernment specifications for preservative oils and coatings used in packaging of government contracts, and the Nox-Rust product conforming with each specification. It also describes uses, methods of application, and physical properties of products which are most often required.

The chart can be obtained without charge by writing to the above address.

#### New Catalog on Roto-Finish

Roto-Finish Co., Dept. MF, 3700 Milham Rd., P.O. Box 988, Kalamazoo, Mich.

All the facts that every user needs to know about the original Roto-Finish process are contained in the latest Roto-Finish catalog being released to the finishing trade by the above company.

The book shows in detail how the Roto-Finish catalogue being released to mechanical deburring, descaling, polishing, brightening and coloring of intricately shaped products.

The illustrated, sixteen-page book is divided into five sections. The first section explains the advantages of the process, a process which has proved

extremely effective since its invention a little over a decade ago. The second part concisely explains the process itself . . . What It Is . . . How It Works . . . and How It Is Used. The third section deals primarily with the types of finishes that the process can produce. The fourth section briefly tells how to obtain the best results through selection of the right Roto-Finish machine and the right Roto-Finish chips. Part five shows typical parts improved by the process with the balance of the book devoted to illustrated descriptions of the machines, accessories and specially designed Roto-Finish chips and finishing compounds. Back page of the book shows the Roto-Finish laboratory and offers the services of the company's engineers in solving finishing problems.

Copies of this informative catalogue can be obtained without cost.

#### Removal of Buffing Compounds From Metals

Philadelphia Quartz Co., Dept. MF, Public Ledger Bldg., Philadelphia 6, Pa.

Stearic acid is an important part of

many buffing compounds and the efficient removal of this material from work which has been buffed or polished is a constant challenge. In a paper entitled, "Removal of Stearic Acid from Surfaces by Alkaline Detergents," (1) J. Fred Hazel and William Stericker have indicated that too high a concentration of an alkaline cleaner in removing stearic acid from zinc did not give as good results as an intermediate concentration. It was determined that this was the result of the sodium stearate, which had been formed, salting out on the work and which then had reduced solubility under the existing highly alkaline conditions. The thin film thus formed prevented any further cleaning from taking place. Many a plater has found that the work has not been improved by throwing in several more pounds of cleaner, and in fact has often become worse. The cleaners used in the above tests were sodium hydroxide, trisodium phosphate, sodium carbonate and several types of sodium silicate. Reprints of the article may be obtained by writing.

(1) Hazel, F. and Stericker, Wm., Ind. & Eng. Chem. **43**, 919, 1951.

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Ni—Peelings . . . Strippings . . .  
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*Speeds Pickling Cycle  
Assures Maximum Drain-off  
Makes Rinsing Easy*

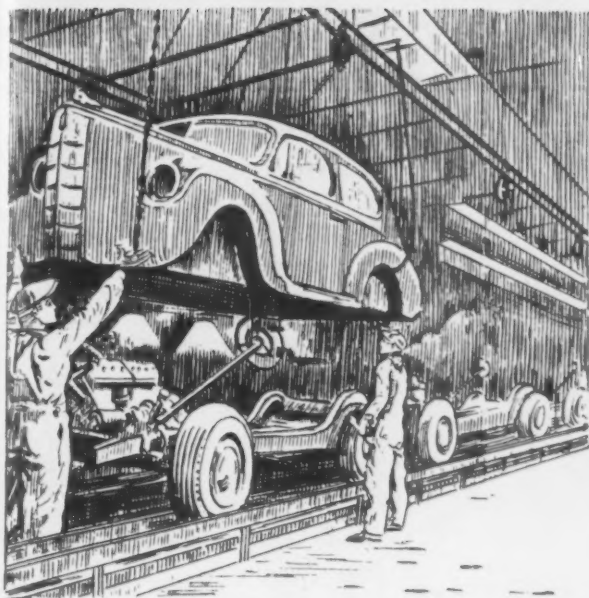
0.1% of ACTIVOL on the weight of the acid solution added to your pickling bath will **activate** your acid to produce results heretofore never achieved. Acid action on oxide scale is accelerated yet leaves the metal smooth and clean and free of pits. The acid drains back into the bath as metals are removed from the pickle so quickly and completely that savings in acid consumption as high as 40% are possible in many cases. Rinsing is simplified and improved through the elimination of much of the costly carry over formerly a problem.

ACTIVOL is outstanding for such applications as pickling, anodizing, galvanizing, plating, wire drawing, bonderizing, etc.

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# MOTOR CITY PLATING NEWS



by

*Edward Finne*

On November 14th, an explosion and fire at the plating and foundry supply house of the *A. T. Wagner Co.*, 2720 Wight, Detroit, destroyed about one third of their warehouse. The four alarm fire brought more than 25 pieces

of equipment because of the heavy winds and because of chemicals stored in the warehouse.

Damage was estimated at \$100,000 and included building and plating and foundry supplies. The fire did not

damage the general office area other than to smoke it up. Deliveries were not affected too much.

\*\*\*\*\*

*Paul Henning*, of Detroit Plating Industries, and a long time member

## LUSTRE ↔ SEAL

THE NEW DISCOVERY — A TRIPLE ACTION COMPOUND

### 1. CUTTING

Rapidly removes polishing lines from both soft and hard metals.

### 2. COLORING

Produces a lustre unobtainable with ordinary coloring compounds.

### 3. SEALING THE SURFACE

Seals surface pores for greatly increased corrosion protection.

Easily removed in ordinary cleaning cycles for subsequent plating.

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Production Problem.**

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DETROIT 17, MICHIGAN



of the Detroit Athletic Club, was initiated into the DAC's Quarter Century Club on Dec. 1st. Paul has bowled regularly for over 25 consecutive years in DAC leagues—in fact, he has bowled for 36 years in DAC circles and is considered one of the deans of the club's 700 bowlers.

\*\*\*\*\*



*James J. Malone*, vice-president and general manager of *United Platers, Inc.*, of Detroit, has recently become President and General Manager of the Jack O'Loan Travel Agency at 2029 National Bank Building, Detroit 26.

Jim has been connected with United Platers for 15 years during which time this job plating plant has increased tremendously in size—so much so that it is by far the largest shop in Detroit devoted to every type of metal finishing. He has been very active in plating organizations, serving as vice-president of the Detroit branch of the AES and as an officer of the Plating Institute.

Jim invites your patronage in his new venture for all types of national and international travel service.

On Friday, November 30th, in the Michigan Room at the Hotel Statler, the Detroit branch broke with a long established tradition and presented the annual educational session on a Friday evening.

Appearing before a capacity audience, *Don Bigge* of the Chrysler Corp., chairman of the meeting, presented the following speakers:

*Dr. Jesse E. Stareck*, of the *United Chromium Corp.*, who spoke on the "Pyrophosphate Copper Bath."

*Dr. A. K. Graham*, of *Graham, Crowley & Associates*, who gave a talk on "Basic Cyanide Copper Plating."

*B. C. Case*, of *Hanson-Van Winkle-Munning Co.*, whose subject was "Periodic Reversal Copper Plating."

*W. P. Innes*, of *General Motors Research* who talked on "Acid Copper Plating."

This Symposium on copper plating was, as usual, a pertinent subject for the plating industry in these times of nickel restrictions.

On Saturday, December 1st, at the Hotel Statler, the Detroit Branch presented their annual December party. This year the divorcing of the technical session and the party proved to be a much better arrangement than those in previous years.

The dinner dance taxed the capacities of the Statler with its more than 1,600 attending party-goers. As usual, the excellent Statler dinner was served, the ladies each received their welcome present and the floor show following had to be presented twice in two ballrooms to two separate groups of platers and their women folk.

Entertainment consisted of four excellent acts—The Four Woodsons, The Welsh Gleemen, Johnny O'Brien and Eddie Collins.

Dancing followed in the two ballrooms with music by Ray Gorrell and Johnny King and their orchestras.

*Fred Wagner* and his committee members deserve a great hand for the December Party. The Committee consisted of *O. H. Tiedeman*, *Frank Clifton*, *Walter Pinner*, *K. Lenhard* and *Bob Redmond*.



## Electro-Cupralum Anodes

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A NEW AND REVOLUTIONARY DEVELOPMENT  
Electro-Cupralum Anodes are manufactured by combining copper and lead through a Homogeneous Extrusion Process whereby the two metals are chemically and inseparably bonded together.

The resultant product consists of a full width continuous copper electrode with a Homogeneous lead covering on all sides except the underside of the copper hook.

#### FEATURES

1. Ten times the electrical conductivity of any Lead Anode.
2. Faster, better plating.
3. Even distribution of current through solution.
4. Permanently rigid.
5. Tenacious, insoluble coatings.
6. No build-up of temperature.
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Electro-Cupralum Anodes are superior because they combine the superior conductivity of copper with the superior protection of lead.

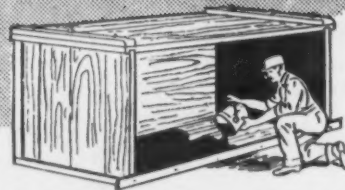
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When Rubberite cools, it has characteristics similar to soft rubber. Will not crack, scale, or run in the hottest weather. Write for complete information.

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## Associations and Societies

### AMERICAN ELECTROPLATERS' SOCIETY



#### Baltimore-Washington Branch

The November meeting was a dinner meeting held at the Hotel 2400 in Washington, D. C.

A.E.S. president *Cleve Nixon* was the honor guest and was inducted into "The Order of the Pot" by Past Supreme President *Ken Huston*.

*Dr. William Blum*, who retired from the National Bureau of Standards at the years' end, was also honored by *Tom Slattery*, who briefly reviewed Dr. Blum's life and Tom's own association with him.

President *Vernon Lamb* then presented Dr. Blum with a rod and reel as a small token of appreciation for the honored Doctor's services to the

local branch and the Society as a whole.

*Cleve Nixon* finished the program by presenting a topic discussing substitute finishes now being used and considered for use to replace critical metals.

#### New Haven Branch



Bill Sheane

The accompanying photo shows *Bill Sheane* in the midst of giving an excellent talk on Government Specifications. Bill, as Sales Manager of *Zapon*, has been very actively concerned with his company's preparations to meet these specifications, and has amassed a very considerable fund of information in regard to them.

All this information he carefully

condensed and simplified so that he was able to present a very clear picture of one of the most confusing subjects concerning finishers today.

#### Chicago Branch Annual Educational Session

At the November meeting of the Chicago Branch, the general chairman for the annual Banquet and Educational Session, *Mr. Harold Smallman*, reported that the event will take place on Saturday, January 26, 1952 in the Conrad Hilton Hotel (formerly the Stevens). The speakers for the Educational Session will be:

*R. M. MacIntosh*, of Tin Research Institute. Subject: "Speculum Plating."

*Dr. Alan Chester*, of Promat Div. of Poor & Co. Subject: "White Alloy Plating."

*D. R. Meserve*, of United Chromium, Inc. Subject: "Organic Finishes of Plated Surfaces."

The Chicago Branch wishes to extend an invitation to society members and all those interested in Metal finishing to come to this affair on Saturday, Jan. 26, at the Conrad Hilton Hotel.

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Metal Cleaners for all purposes.

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Your sample parts processed without cost or obligation, furnish cycle time, cost and materials best suited for your jobs.

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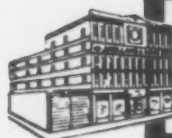
## IS YOUR PROBLEM PLATING?



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Motor Driven Tank Rod Agitators. Single or Double arms.

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## Philadelphia Branch Annual Educational Meeting

The Philadelphia Branch held their Annual Banquet and Technical Session on November 19, at the Broadwood Hotel, Philadelphia.

Some highlights from the remarks of principle speakers are included below.

1. *Dr. William Blum*, National Bureau of Standards, Wash., D. C. "Summary of Electrodeposition Researches at the National Bureau of Standards."

Dr. Blum summarized the highlights of thirty-eight years of research by his group in electroplating. He described in detail the background, development and applications of the following contributions of the Bureau: During World War II the chrome plating of gun barrels and the use of substitute materials for scarce nickel, outdoor exposure tests, the Magne-gage, Nodule Method for determining adhesion, contractometer, the physical properties of electrodeposited nickel and chromium, the Haring Cell for measuring polarization and throwing power, the calculation of primary current distribution, applications of radio-



active isotopes and the deposition of unusual metals as molybdenum, tungsten, vanadium, aluminum, titanium and zirconium.

2. *Mr. Gordon Mustin*, Bureau of Aeronautics, Navy Department, Wash., D. C. "Plating and Surface Treatment in Naval Aircraft."

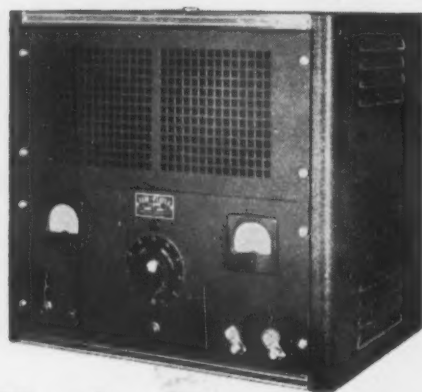
Metals used in naval aircraft are subject to the following types of corrosion hazards:

- Climatic, i.e. heat and humidity in tropics.
- Operational, i.e. ocean spray, stack gases.
- Operating materials, i.e. combus-

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Typical small parts finished with tin-zinc plating.

Tin-zinc plating — M & T's new plating process — uses 20% less tin than electrotinning; approximately 60% less than hot-dipping.

Yet, the tin-zinc deposit provides unsurpassed corrosion resistance — excellent solderability — a bright, silvery finish when burnished or buffed. Ease of application and economy are additional features.

Tin-zinc plating is applicable to steel, brass, copper and other base metals — affords an outstanding finish for malleable iron castings. It is available for applications where tin is now being used — may also be employed for a number of other essential uses.

Investigate!

Write for Technical Data Sheet No. 107 containing complete, up-to-the-minute information on tin-zinc plating procedure.



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tion gases, galvanic action.

d. Construction factors, i.e. heat treatment salts.

The cleaning and pickling requirements and specifications for various metals were then discussed.

A detailed discussion of the specific applications of various plated coatings was then given. The channel type porous chrome is preferred over the pin point type for increased wear resistance and lower oil consumption. Nickel is used for corrosion resistance especially at high temperatures. Tin and cadmium are plated separately and then baked to give an alloy coating which gives corrosion resistance to the inside of an engine. Tin, lead-indium, cad-indium and copper are applied for anti-galling purposes.

The applications of the various surface treatments of aluminum, such as conversion coatings, anodizing, chromic acid wash, and the alcoholic-phosphoric acid wash were discussed.

While most specifications require the salt spray test, this test is on its way out for many coatings. For anodized coatings, it will be replaced by coating weight such as 200 mg./SF

for chromic acid and 1,200 mg./SF for sulfuric anodized coatings.

The new HAE treatment of magnesium has extraordinary corrosion resistance and many other advantages. Some disadvantages are spalling on bending and decrease in fatigue resistance of the magnesium.

3. Mr. C. F. Nixon, Director, Process Development Section, General Motors Corp., Detroit, Mich. "*Decorative Chromium Plating without Nickel.*"

This was a progress report of findings in the development of suitable finishes for automobiles. Four cycles are now in use.

1. More copper, less nickel, chromium, lacquer.
2. Copper, no nickel, chromium, lacquer for outside use, no lacquer for inside use.
3. Zinc, chromate bright dip, lacquer.
4. Copper, white brass, chrome, lacquer for outside use, no lacquer for inside use.

They do not have any reliable accelerated tests to evaluate the above coatings but are depending on educa-

ted guesses. Salt spray tests are not satisfactory and even outdoor exposure tests are not the final answer. A research program on accelerated tests is needed.

The following are additional notes regarding the above four cycles:

1. For outdoor use, the thickness of nickel = .0003"-.0005" with a total thickness of 0.0015". For indoor use, the nickel thickness is 0.0002"-.0003". The application of wax preparations or oil by the owner on outdoor plating is being recommended. In plating the thinner nickel coatings, the same high current density is used but the time is decreased.

2. The elimination of nickel has lost the self-leveling action of this metal, with the result that the steel must be buffed better.

3. This cycle is now extensively used both on zinc die castings and on steel. The color, however, is different from chrome.

4. This cycle is used on automobile parts to a small extent. The white brass is a development of the Oplinger bath and now consists of 5 to 20% copper, rest is zinc. The deposit has

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Let DAYBRITE solve your COPPER PLATING problems. Check these important, money-saving items:

- ✓ Low Conversion and Operating Costs
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- ✓ Ideal As Undercoat For Chromium After Color Buff or Brite Dip.

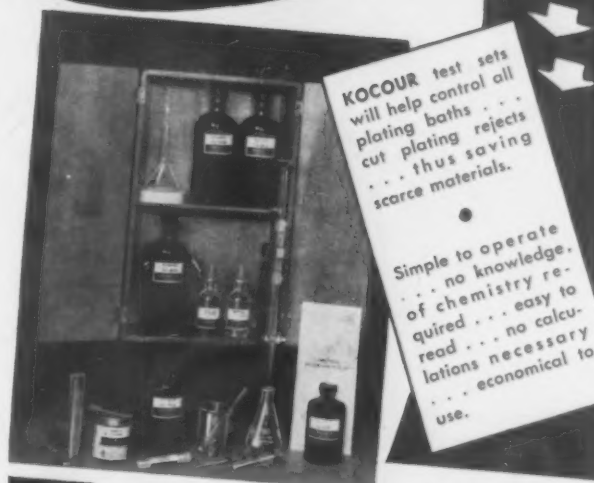
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Dayton 4, Ohio

## Save Materials! USE KOCOUR TEST EQUIPMENT For All Plating Needs!



KOCOUR test sets will help control all plating baths . . . cut plating rejects . . . thus saving scarce materials.

Simple to operate . . . no knowledge of chemistry required . . . easy to read . . . no calculations necessary . . . economical to use.

KOCOUR test sets, similar to the above, can be used for controlling plating, cleaning, pickling, and anodizing baths. . . . Special sets can be provided for your requirements.

Write today for complete information — no cost or obligation.

**KOCOUR CO.**

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Specify KOCOUR test sets from your supplier.

self-leveling properties and can be readily chrome plated. Addition agents are required for brightness. The present specification on the white brass is 0.0002" to 0.0003". They are at present working to improve the stability of the bath with respect to brightness and self-leveling properties and to eliminate brittleness and hairline cracks which may develop when the lacquer is baked.

#### Cincinnati Branch

After a belated but most enjoyable turkey dinner on November 28, 1951, the Cincinnati Branch of the A.E.S. proceeded to a number of important items which had accumulated on the agenda since our previous meeting. Once President *Robert D. Miller* had called the meeting to order, he presented several letters which had been received from national headquarters, particularly the letter from President *C. F. Nixon* dealing with the Research Program. A discussion then followed on the letter from the Chicago branch suggesting a mid-year meeting. The President requested that the Secretary send copies of this letter to the Dele-

gates, Alternates and Board of Managers.

New members and guests were introduced after which the branch was informed that Vice-President *C. C. Claybaugh* was resigning his office due to the fact that he was leaving the city.

The subject of a picnic next summer was presented, and after discussion it was decided to hold a picnic, preferably on a Saturday in June rather than a week-day as in the past. *Stewart Chipman* and *Ray Barry* were appointed a Picnic Committee.

The speaker of the evening, *Sam Johnson*, of Weirton Steel Co., and an old friend, was introduced by Mr. Miller. Taking "Tin Plating on Wide Strip Steel" as his subject, Mr. Johnson used an excellent movie which showed the manufacture of steel and eventual tin plating to start off the proceedings. Since both the electrolytic and hot dip processes of tin plating were shown, Mr. Johnson dwelt considerably on these methods pointing out that the former process was only fifteen years old. In that time, he stated the electrolytic method had become most popular since many canned products only required 40% as much

tin as would be put on by the hot dip process, thus effecting a considerable savings. Mr. Johnson concluded his highly interesting talk by showing slides which graphically illustrated the various methods of plating steel.

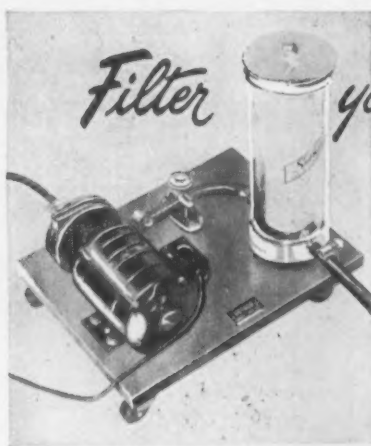
*Bill Young*, Manufacturers' Representative, served as host for the usual Social Hour which followed.

#### Los Angeles Branch

*Paul Silverstone*, chemical engineer of *Super Matrix Company, Inc.*, Hollywood, presented a comprehensive review of current techniques of electroforming metals and nickel plating at the December 12 meeting of Los Angeles Branch.

Mr. Silverstone's presentation was complete and detailed in view of the fact that he spoke extemporaneously, having agreed to substitute for the originally scheduled speaker when *Myron Orbaugh*, of the *Bone Engineering Co.*, was called out of town shortly before the meeting date. A pat on the back is due *Earl Arnold*, Librarian, for arranging for so fine a speaker on short notice.

Mr. Silverstone first gave some background, declaring that the first



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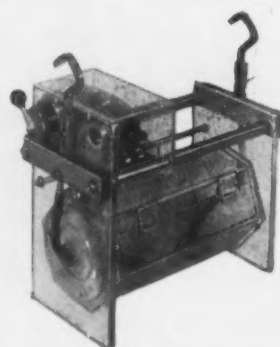
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electroform was made in 1838 for electrotype! He devoted the major part of his talk to exhibiting variously shaped and sized items of electroformed metal, describing the method of fabrication and plating in informal comment, interpolated now and then by questions from the members.

Among parts lending themselves to fabrication by electroforming he cited radar domes, radar wave guides, odd-shaped ducts, and low-pressure molds for aircraft sections which are electroformed because of their deep draws or huge size.

The speaker stated that the types of baths now being used are copper, nickel and iron, although silver is being used to some extent.

The talk concluded by showing of a film in which samples of small tubing with walls of 5,000th inch thickness, and other forms of electroformed items were depicted.

Branch President Roy Lostutter presided over the business session. Guests introduced included, W. J. Wallace, Rohr Aircraft Co.; Harry Rubin, Ajax Hardware Company; R. Baker, Alert Supply Co.; A. J. Chapleau, Anachem Laboratories;

Wilber Sims and G. Heinecke, Quick-Set Locks, Inc., and Ralph Taylor, General Electric Co.

John Millhorn, head of the Mefford Chemical Co's plating supply division, was appointed by President Lostutter as general chairman of the branch's 1952 annual educational session. The appointment was unquestionably due to recognition by the officers and board of the exceptionally fine work John had done as a member of such previous committees. Among other things, John was quite successful during the past several years in arranging for trophy cups which are presented at the annual waltz contest.

Millhorn announced that he would report the personnel of his committee at the January meeting of the branch, at which time also the date for the annual educational session will be determined.

Secretary G. Stuart Krentel reported that the job situation has reached the stage where requests for competent plating shopmen exceed the number of applicants. He requested that anyone knowing of experienced platers who are seeking employment, report the names to the branch secretary,

who will be able to refer them to plant owners.

The campaign being conducted by Orbaugh and Krentel to keep meeting attendance at a high level received a severe test on the night of December 12, but found them coming through with flying colors. Despite a heavy and fairly continuous rain, roll call disclosed a total of 65 in attendance.

#### Indianapolis Branch

The December meeting was held at Fox Steak House, with 25 present for steak dinner and 37 present for the business meeting.

The speaker of the evening was one of our own members, Mr. H. Kennedy, of DuPont. His subject was "Detection of Impurities of Cyanide Baths." In cyanide copper baths the principal trouble is the removal of zinc. Since zinc is very laborious to remove, it is advisable that parts be removed daily from the bottom of tanks. Polysulphite can be used for this impurity. Cadmium, silver and tin impurities can be removed by plating out at low current densities. Carbonates should be maintained at 2-8 oz. per gal. Above this amount the removal is suggested

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by freezing at a temperature of not less than 26 degrees. Potassium carbonate impurity can be removed by the addition of Barium Hydrate or Calcium Hydrate; the later is cheaper and better. Chrome impurity can be removed by the addition of sodium hydrosulfite. Organic impurities can be removed by plating out or the use of activated carbon.

In zinc baths the following impurities will cause trouble; copper, for which the removal is zinc dust at 1 to 5 lbs. to 100 gallons solution; Lead—The use of polysulphite of 1-3 grams to 1 gallon solution; Cadmium—the same method as for Lead; Chromium (from chromate dip)—removal with the use of Sodium Hydrosulfite or plating out at high current densities, 75 amp./sq./ft.

In cadmium baths the copper contamination over 3 grams per liter is removed by plating out. Lead & silver will also cause trouble. Carbonates must be frozen out as in zinc.

#### Baltimore-Washington Branch

The December meeting of the Baltimore-Washington Branch was moved ahead a week to the first Tuesday in

the month, December 4th, so as to take advantage of the presence of several foreign visitors to the Symposium of Electro-deposition Researches which was being held in Washington December 4-6.

The gathering was held at the National Bureau of Standards in D. C. at 8 P.M. Dr. G. E. Gardam, of Great Britain, presented the present status of plating in his country, while Dr. P. Baeyens, of Holland, enlightened us on the plating practices employed in the Netherlands.

#### AMERICAN INSTITUTE of MINING and METALLURGICAL ENGINEERS

##### Round Table on Addition Agents to be Held in New York

A two-day meeting on the effects of addition agents in the electrometallurgy of metals will be held February 18-21 at the Hotel Statler, New York City. The meeting will be an "off the record" affair, inasmuch as no plans are being made to publish the discussions that take place.

Following is an outline of the subjects to be discussed.

#### First and Second Sessions

- I. Introduction and Historical—S. Skowronski.
- II. Theoretical—W. B. Kleiner.
- III. Addition Agents in the Refining of Copper.
  1. Glue—J. H. Schloen.
  2. Glue and Goulac—Carteret, Baltimore.
  3. Glue, Goulac and Oil—Copper Cliff.
  4. Casein and Glue—Australia.
  5. Casein, Glue and Goulac—M. A. Mosher.
  6. Thiourea—Finland.
  7. The Functions of Chlorine as an Addition Agent—Dr. Winkler.
  8. Possibility of Other Types of Addition Agents.
  9. Estimation of Addition Agents.

#### Third Session

- IV. Addition Agents in the Refining of Other Metals.
  - A. Silver
    1. Tartaric Acid—Cerro de Pasco (W. C. Smith).
  - B. Lead—Consolidated.
  - C. Tin—Lowenheim.
  - D. Lead-Tin—Heberlein.
- V. Additional Agents in the Winning of Metals (Insoluble Anodes).
  - A. Copper—Inspiration.
  - B. Zinc—In charge of Prof. Hanley.

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## News from California

By Fred A. Herr



**Alberto Diez**, brother of **Alfredo Diez**, president of **Discos Zeida**, an electroplating firm in Medellin, Columbia, South America, spent six weeks in Los Angeles during October and November learning details of record making, stamping and plating in the Los Angeles plant of Coast Export Co.

The youthful member of the Colombian metal finishing firm was indoctrinated into the technique of record making and processing by **Paul Mayer**, head of Coast Export, and **Ralph Wiser**, superintendent of the firm's record matrix stamping and plating department.

Coast Export operates a 44 position plating room at 2534 West Pico Blvd., Los Angeles. The shop is equipped to product 40 record stampings a day. Mr. Mayer referred to it as one of the

most complete record manufacturing and record plating equipment supplying firms in the world. He declared that Coast Export supplies 90% of the demand for finished records, as well as the supplies for making and processing them, in Central and South American countries.

Coast Export's Los Angeles shop contains 24 two-position tanks of 50 gallon capacity each. There is also chrome tankage of commensurate requirements, a polishing lathe, circular shears and 2100 amps of rectifier facilities, plus smaller units essential to the processing of a steady flow of aluminum base recorded acetates that are shipped to the Los Angeles plant for development into the final copper stampings.

Until quite recently, Mr. Mayer explained, recordings were made by orchestras in Columbia and other South American countries, but could not be final processed there because none of the local plating shops were equipped to handle them. The recording was made locally in the form of a recorded acetate with aluminum base.

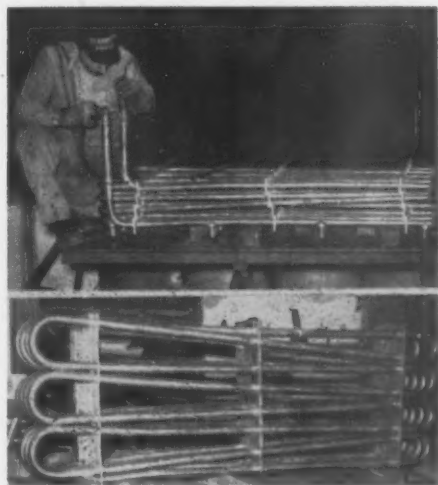
The year 1951 saw a change in the

record making situation in Central and South American countries, Diez and Mayer reported. The round trip to Los Angeles for making the finished plates took too long. Greater speed is demanded now and Latin American plating houses are responding to this demand by rushing equipment installations that will enable them to handle the whole process locally.

Young Diez' October trip to Los Angeles was tied in with the trend to develop a local record plating industry in Columbia. Alfredo Diez, head of the Discos Zeida firm in Medellin, is among the Columbian electroplating leaders who has plans for expanding his present job plating shop to handle record production in all its phases.

Young Diez reported that approximately ten shops in Columbia at present are equipped to press records, but none can as yet produce the master matrices, mother plates and copper stampings, or handle the chrome plating job in the exact form required for copper record stampings.

His brother's shop in Medellin (a city of about 125,000 population some 200 miles northwest of Bogota, the capital) is typical of the 10 or so



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plating shops in Columbia. The shop is equipped to do general job plating in chrome, copper and several other standard finishes, mainly on metal furniture and gun parts. It cannot, however, handle the complete record processing and plating job.

In addition to studying the technique of record processing while in Los Angeles, young Diez was commissioned by his brother to purchase from Coast Export Company the equipment for setting up record stamping and plating facilities in Medellin. Preceding him when he left Los Angeles for home late in November was a shipment of equipment designed to set up a 10-position record stamping and plating installation. Supplementing the solution tanks were a polishing lathe, centering lathe, two punch presses, a 300 ampere rectifier and miscellaneous smaller items.

Three other job shop operators in Columbia have plans underway for establishing record divisions, Diez declared. These other shops, he said, will most likely be established in the cities of Bogota, Cartagena and Barranquilla.

International Rectifier Corp. on December 1 moved its general offices, engineering department and assembly facilities from 6809 South Victoria Ave., Los Angeles, to a new plant and



office building of considerably larger area at 1321 East Grand Ave., El Segundo, Calif.

The new plant, which contains 12,000 square feet of floor area, is located on a two acre site. The tract is large enough to allow for future expansion as needed. It is located in the immediate vicinity of the Los Angeles International Airport, and is readily accessible to out-of-town visitors.

The manufacturing facilities are air

conditioned throughout and the firm reports that the most modern equipment has been installed, ranking the plant among the finest for the production of selenium rectifiers.

International Rectifier Corp.'s Victoria Ave. plant in Los Angeles will be retained for research purposes only.

Ten subsidiary companies of Union Carbon & Carbide Co. of New York are scheduled to occupy, on a 25 year lease, an extensive new factory building being erected at Soto Street and Leonis Blvd., Vernon, Calif., at a cost of \$1,300,000 for land, construction and equipment.

The building occupies a 3½ acre site. Warehouse, distribution and plant facilities will share 45,000 square feet of floor area, with 25,000 square feet allocated to offices. Various production phases of Union Carbon & Carbide's activity in alloys, metals, chemicals, electrodes and carbons will be housed in the new structure. It is reported that the Vernon project is part of the company's 1951 \$100,000,000 national plant expansion program.

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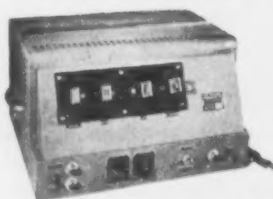


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*Beckman Instruments, Inc.*, South Pasadena, one of the country's major manufacturers of electronic pH meters, has established a special products department at 492 East Merkimar Street, Pasadena. Offices, research laboratory and a complete model production department are included in the Pasadena facilities.

*Joseph Sunderhaus*, 63, a prominent figure in the Southern California plating industry for 30 years, was killed almost instantly on November 10 when struck by an automobile while crossing Western Avenue at 145th Street, in Los Angeles.

Funeral services were held on November 13 at Pierce Brothers Mortuary, with a delegation of members of Los Angeles Branch of the American Electroplaters Society, of which Mr. Sunderhaus was a past-president, in attendance. Present from the A.E.S. were Mr. and Mrs. *Marcus Rynkofs*, Mr. and Mrs. *E. W. Francis*, Mr. and Mrs. *John Merigold*, *Don Bedwell*, *Earl Coffin*, *Ed Wells* and *Larry O'Neil*.

He is survived by two daughters, with one of whom he made his home in Covina, Calif., since his retirement from plating.

Mr. Sunderhaus served in the plating department of the Olds Band Instrument Co. in Los Angeles for many

years, being plating foreman upon his retirement from that firm after the close of World War II. He then joined *Dibbern Silversmiths* in Glendale for a period before organizing the *V & J Silverplating Co.* in Pasadena. In 1950 he sold the firm to its present owners but continued to work in the shop on a part-time basis.

*Rohr Aircraft Co.*, Chula Vista, Calif., is now equipped with complete zinc, cadmium and anodizing setups for handling the growing volume of work on various aircraft parts, engine mounts and smaller component units.

Equipment includes a 2,000 gallon zinc tank for plating motor mounts; a 3,000 gallon anodizing tank, 22 feet long, in which are finished plane parts so large they just about fill the tank. Other equipment installed in the expansion of the finishing division include 500 amperes of rectifier facilities, and two 900 gallon barrel platers. *W. J. Wallace* is chief chemist and director of finishing.

Managers of *Turco Products, Inc.*, branches along with assistant branch managers and main office executives, were invited to attend a district managers meeting at Hotel Biltmore, Los Angeles, January 7 and 8.

Invited to attend to hear an exposi-

tion of Turco sales and research plans for 1952 by main office executives were the following district managers:

*A. K. Beard*, Chicago; *T. Few Brown*, New York; *Al Cimbron*, Philadelphia; *A. H. Massey*, Atlanta; *Chris Williams*, Houston; *Edward Broder-son*, Seattle; *George Brums*, Kansas City; *Don Charteris*, San Francisco; and *George Shearer* and *James Sweatt*, Los Angeles. Including assistant branch managers and sales directors, as well as main office executives, arrangements had been made to accommodate 45 to 50 persons.

The following was on the agenda. Presiding, *Dan T. Buist*, national sales, director, Los Angeles; Welcome address by *S. G. Thornbury*, Turco president, and an outline by him of company progress since its founding in 1927, plus a discussion by President Thornbury on future prospects in hitherto unplumbed fields, such as atomic energy and jet propulsion.

Outline of Turco's 1952 sales promotion plans by *F. E. Warmes*, Los Angeles, sales promotion manager; discussion on selection and training of sales engineers by *D. T. Miller*, sales co-ordinator; discussion on prices and distribution by *S. B. Van Dyne*, assistant national sales director; and an outline of new products from laboratory research by *Clark Jackson*, assistant technical director.



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750	6	1150	H. V. W.	7½ HP, 230 VDC
1000	12	850	H. V. W.	20 HP, 220/440V, 3/60
1500/750	8/16	900	Elec. Prod.	20 HP, 550V, 3/60
2000	12	900	H. V. W.	40 HP, 220V, 3/60
2000	30	900	Gen. Elec.	100 HP, 440V, 3/60
5000	6		Munnings-Optimus	

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1000	6	Green	485 V., 3 phase, 60 cy.
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REBUILT AND GUARANTEED  
EQUIPMENT FOR

- POLISHING
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- ELECTROPLATING
- METAL FINISHING

Motor Generator Sets, Rectifiers, Wood, Steel, Lead Lined and Rubber Lined Tanks, Steam Boilers, Rheostats, Polishing, Buffing and Grinding Machines and everything needed for a modern metal finishing department.

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## IMMEDIATE SHIPMENT ATTRACTIVE VALUES

THE FOLLOWING EXCELLENT REBUILT AND GUARANTEED ELECTROPLATING MOTOR GENERATOR SETS AND RECTIFIERS, WITH FULL CONTROL EQUIPMENT:

### — PLATERS —

1—7500/3750 Amp., 6/12 V., A. P. Mun-ning "Optimus." Sep. Exc.

1—6000 Amp., 2-6 V., Jantz & Leist. Sep. Exc.

1—6000/3000 Amp., 6/12 V., Bogue. Synch. Mtr., Sep. Exc.

1—5000/2500 Amp., 6/12 V., Eager Elec-tric Co. Sep. Exc.

1—3000/1500 Amp., 6/12 V., H-VW-M. Synch. Mtr. Exc-in-head.

1—2000/1000 Amp., 6/12 V., H-VW-M Co. Synch. Mtr., Exc-in-head.

1—2000/1000 Amp., 6/12 V., A. P. Mun-ning "Optimus."

1—1500/750 Amp., 12/24 V., H-VW-M Co. Synch. Mtr., Exc-in-head.

1—1500/750 Amp., 6/12 V., H-VW-M Co.

1—1500/750 Amp., 6/12 V., Chaneysson.

1—1000/500 Amp., 6/12 V., Chaneysson Electric Co. Synch. Mtr. Exc-in-head.

### — ANODIZERS —

1—4000 Amp., 40 V., Chaneysson. Synch. Mtr., 440/3/60. Exc-in-head. Complete Controls.

1—1000 Amp., 40 V., Chaneysson Elec-tric Co. Synch. Mtr. Exc-in-head.

2—1000 Amp., 30 V., Ideal. Exc-in-head.

1—500 Amp., 40 V., M.G.C. Exc-in-head.

1—400 Amp., 40 V., M.G.C. Exc-in-head.

1—500 Amp., 25 V., Chaneysson 25 Deg. Synch. Mtr. Exc-in-head.

### — RECTIFIERS —

1—Green Selectroplaters, 1800 Amp., 12 V., for 220/3/60 A.C.

2—Udylite-Mallory Rectifiers. 1440/720 Amp., 6/12 V., for 220/440/3/60 A.C.

1—100 Amp., 30 V., G. E. Copper Oxide Rectifier with separate control 220/3/60.

### — SPECIAL —

2—#101 Production Pipe Polishing Ma-chines.

Many other sizes MG Sets and Rectifiers too numerous to mention.

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